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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

Vienna
19-30 July 1999

Abstract of the national paper of Poland

1. Space activities in Poland are being conducted mainly in the following three fields: (a) space physics; (b) remote sensing; and (c) planetary geodesy.

2. The main institutions involved in such activities are: (a) the Space Research Centre of the Polish Academy of Sciences; (b) the Institute of Geodesy and Cartography; (c) the Astronomical Copernicus Centre of the Polish Academy of Sciences; (d) Warsaw University; and (e) the Warsaw University of Technology.

3. All activity in space research in Poland is coordinated by the Committee on Space Research (COSPAR), a body affiliated to the Polish Academy of Sciences, which also acts as COSPAR National Bureau.

4. It is probably worth recalling that this activity started at the very beginning of the space era, from the time the first Sputnik was launched by the Union of Soviet Socialist Republics, although those first steps were limited to optical observations. The real introduction to orbital experimentation was made in 1973, however, when the Kopernik-500 project, named in commemoration of the 500th anniversary of the birth of Nicolaus Copernicus, was designed and prepared by a team of Polish scientists from Torun and Warsaw. That experiment, an investigation of plasma waves, was flown on board the Intercosmos-9 satellite. Since that time almost 40 individual scientific instruments have been located on board different satellites or space stations and 24 on sounding rockets. Among them are the Comet Halley-Vega mission and the Cassini spacecraft, which is now travelling on its long journey to Saturn and Titan. The main objective of the current Polish programme in the field of space physics is research into space plasma, planetology and space-related astrophysics. Polish scientists are now involved in the preparation of instruments for the following missions: the Rosetta flight to the Comet Wirtanen and landing on the core of the comet, the Mars Express, a European Space Agency (ESA) mission to the planet Mars, Integral, an ESA astrophysical mission, and the French Demeter satellite to study the electromagnetic environment of the Earth.

5. A special chapter in the chronicle of Polish space efforts was the manned flight of astronaut Miroslaw Hermaszewski, which took place in 1978 as part of the Intercosmos programme. During the seven-day flight a number of scientific experiments were performed, including crystallization of HgCdTe in microgravity and a wide range of aerospace medicine experiments.

6. Apart from fundamental science, the application programmes were performed in satellite geodesy, remote sensing and to a lesser extent space technology. The modern fundamental geodetic network for Poland is based totally on the Global Positioning System technique. The laser ranging system operates continuously, tracking satellites with centimetre-level precision. Satellite data are used for cartography, environment monitoring and spatial planning in agriculture and even for disaster prediction.

7. The most important results of satellite remote sensing applications include preparation of a database containing a land-cover map for the whole of Poland on the basis of Landsat thematic mapper images. The map is widely used for different types of environmental study. The crop condition assessment system, based on operational use of meteorological satellite images from the National Oceanic and Atmospheric Administration of the United States of America, was prepared recently and is being used effectively for the monitoring of crop growth in Poland, as well as for the prediction of drought and the estimation of yields. High-resolution satellite data are used in the creation of forest information systems, as well as in large-scale monitoring of changes in forests resulting from human activity and natural disasters.

8. Another application of satellites in Poland is in meteorology. The first experiments using meteorological satellite data were conducted from 1963 to 1967 at the Rocket and Satellite Research Department of the Institute of Meteorology and Water Management in Crakow. Since 1967, meteorological satellite data have been used regularly there. Since 1979, satellite data from the Meteosat geostationary satellite are received and used in Crakow. A new receiving station for both geostationary and polar orbiting satellites was installed in 1996.

9. Over the last 31 years of satellite data use, many scientific research projects have been completed. The main topics concern the use of satellite data in meteorology (clouds, rain, distribution of temperature and moisture in the atmosphere), hydrology (use of satellite data in hydrological modelling), monitoring of the environment (vegetation monitoring, snow and ice detection, radiation levels) and oceanology. Since 1993 maps showing total ozone levels over central Europe are prepared from daily readings of satellite data.

10. The Institute of Meteorology and Water Management cooperates closely with the European Organization for the Exploitation of Meteorological Satellites. Poland will become a cooperating member of the Organization in the very near future.

11. Space activities in Poland are now based on international cooperation, first and foremost with ESA member countries. In 1994 the Government of Poland signed a cooperation agreement with the Agency, opening the door for active participation of Polish scientific groups in ESA space missions and programmes. In the next few years that cooperation will be intensified, as the major focus of space activities in Poland. However, cooperation with other partners, such as the National Aeronautics and Space Administration of the United States, the Russian Space Agency and Ukraine, will be continued and strengthened.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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19-30 July 1999

Abstract of the national paper of Algeria

1. Algeria has demonstrated a steadily growing interest in the development and application of space science and technology as a key means for the implementation of national socio-economic and cultural development programmes, although most of its activities in that area are still focused more on applications than space technology.

2. For instance, in the vital field of remote sensing and cartography, in which Algeria's activities are coordinated by the National Geographic Information Council, representing the relevant national sectors, that interest is reflected in the ever greater use of satellite-derived remote sensing data in various areas related to sustainable development (agriculture, water resources, natural disaster management, environmental protection, land use planning, natural resource exploration and utilization, transport, etc.).

3. In the specific area of remote sensing applications in the transport sector (civil aviation, the merchant navy and meteorology), national space activities are concerned in particular with Earth observation, location and positioning, and data-gathering and transmission. In that connection, the National Meteorology Office operates a number of remote sensing facilities to meet the requirements of, for example, meteorological services, weather and climate monitoring, weather observation and general forecasting, national water resource evaluation, the fisheries industry and migratory locust control.

4. As a State member of the International Civil Aviation Organization, the World Meteorological Organization, the International Maritime Organization and the International Telecommunication Union, Algeria is also directly involved in the Global Navigation Satellite System (GLONASS) the World Weather Watch and its various constituent elements, the system for environmental emergency response to marine pollution and the World System for Emergency and Safety at Sea.

5. At the regional level, Algeria is a member, in particular, of the Regional Centre for Remote Sensing of the North African States and is host country for the headquarters of the African Organization for Cartography and Remote Sensing.

6. In the field of satellite communications, Algeria has made notable progress in meeting national needs, in particular, with regard to telephony and radio and television broadcasting. It operates a domestic satellite network that is currently one of the most dense in the world.

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7. This progress is set to be consolidated in the course of the current year as a result of various projects for upgrading and modernizing the telecommunication network through the introduction of very small aperture terminal (VSAT) systems and the commissioning of a coastal Earth station operating as part of the International Mobile Satellite Organization network with the aim of providing improved services for users in various domains such as telephony and facsimile transmission, data transmission, telex communication, radio paging, distress traffic and personal mobile communications by satellite.

8. In the field of education, training and research, mention should be made of a number of courses offered by Algerian universities. Space-related research activities have national priority status under the Law on Five-year Forward Programming and Policy-setting in the Area of Scientific Research and Technological Development for the Period 1998-2002, promulgated on 22 August 1998. Out of the 30 or so research programmes envisaged by that Law, a dozen or more are connected in some way with remote sensing, space geodesy and space programmes such as the ALSAT project for the design, manufacture and operation of a small satellite. Financed by the State through the National Research Fund and through credits allocated to research establishments and bodies, the implementation of those programmes is entrusted to a national network of research teams and the National Space Technology Centre.

9. As a State party to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Algeria regards outer space as the common property of the whole of humanity to be safeguarded, therefore, as a zone of peace and cooperation. Accordingly, it attaches the utmost importance to its contribution to the efforts undertaken by the United Nations through its Committee on the Peaceful Uses of Outer Space with the aim of enabling all States, especially developing countries, to enjoy the benefits offered by space science and technology applications. For that reason, Algeria was keen to participate in the work of the Regional Preparatory Conference for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space for Africa and the Middle East, held in Rabat, and in the establishment of the African Regional Centre for Space Science and Technology—in French language, which is based in the same city.

10. With regard to the forthcoming Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), Algeria wishes to express its hope that the international community will devote greater attention to strengthening interregional, regional, subregional and bilateral cooperation aimed at facilitating broad access by developing countries to space technologies and techniques and at intensifying programmes to strengthen their national capacities in that field, especially with respect to training, consultancy and partnership.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

Vienna
19-30 July 1999

Abstract of the national paper of Austria

1. The Austrian national paper provides an overview of space science and research carried out by the different scientific groups at Austrian universities and research institutions. That work is considered fundamental for any serious investment of a State in space technology and its application.

2. The funding for the various space activities is provided predominantly by the Federal Ministry for Science and Transport and distributed to the individual institutions through the Austrian Academy of Sciences and the Austrian Science Fund. Other projects are carried out under research and development contracts from the European Space Agency (ESA), the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Commission.

3. In 1987 Austria became a full member of ESA. The annual contribution of Austria to the Agency amounted to about 440 million schillings in 1999. Austria has also been a member of EUMETSAT since 1995, with an annual contribution of S 99 million in 1999.

4. Participation in ESA and EUMETSAT programmes assists the smaller member States to bridge the technological gap to the larger countries and provides a basis for advanced technological research in universities and industry. More than 80 per cent of the Austrian financial contribution to international organizations like ESA will be returned in the form of research and development contracts, in particular to small and medium-sized companies and research groups in universities.

5. Any collaboration with international industrial consortia in the field of advanced technologies gives Austrian scientists and engineers the possibility to participate in those most challenging activities, which otherwise could not have been done. In participating to ESA programmes priority is given to the scientific exploration of the universe and the solar system, to satellite communications and navigation, to the observation of the Earth and atmosphere from space and to space transportation and technology development.

6. This means that, in addition to its involvement in the ESA mandatory programme (general activities, including general studies, the technology programme and the space science programme), Austria participates in the following optional programmes:

(a) Earth observation programmes:

(i) European remote sensing satellites ERS-1 and ERS-2;

(ii) Earth Observation Preparatory Programme (EOPP);

(iii) Polar orbit Earth observation missions (ENVISAT and METOP);

(iv) Meteosat second generation (MSG);

(v) Earth Observation Envelope Programme;

(b) Programme for the Development of Scientific Experiments (PRODEX);

(c) General Support Technology Programme (GSTP);

(d) Telecommunications:

(i) Advanced Systems and Technology Programmes (ASTP);

(ii) Data Relay Technology Mission (DRTM);

(iii) Advanced Research in Telecommunications Systems (ARTES);

(iv) Navigation (GalileoSat);

(e) Space transportation systems:

(i) Ariane-5 development programme;

(ii) Complementary Ariane-5 programmes, including Ariane-5 Plus;

(iii) Future European Space Transportation Investigation Programme (FESTIP) and Future Launcher Technology Programme (FLTP).

7. A general evaluation of Austria's collaboration in ESA activities shows satisfactory results. The industrial return coefficient calculated by ESA for all countries, showing the geographical distribution of contracts awarded, amounted to 0.97 for Austria as at 31 December 1998. Some 85.7 per cent of the contracts were awarded to Austrian industrial companies and 14.3 per cent to scientific research institutions and universities.

8. The Institute of Space Research of the Austrian Academy of Sciences is the centre of activities for scientific space research in Austria. The Institute developed instruments that were flown on Russian space probes to planets and comets. Other instruments are being developed for different ESA scientific missions. Bilateral activities with France, the Russian Federation and the United States of America are being carried out in the fields of space science, life science and remote sensing.

9. Austrian research groups are analysing satellite remote sensing data for different applications such as cartography, land use, snow and ice cover, water run-off, landslides, meteorology and climatic changes both in Austria and worldwide using data from the optical and microwave sensors of various remote sensing satellites.

10. In the area of applying space technology for developing countries Austria plays a major role in the Committee for the Peaceful Uses of Outer Space, having chaired the Committee for nearly 40 years. It supports the Committee's work by assisting in the organization of the United Nations Conferences on the Exploration and Peaceful Uses of Outer Space and of symposia for developing countries.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

Vienna
19-30 July 1999

Abstract of the national paper of France

1. The holding of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) on the eve of the twenty-first century, 50 years after the conquest of space first began, affords us an opportunity to take stock of this major episode in the history of humankind and to attempt to map its future prospects and implications.

2. A primary task of the Conference is to review the new trends that have appeared since the previous United Nations space conference was held, 17 years ago, and which are the outcome of two far-reaching changes that have taken place in the intervening period: on the one hand, a shift in the global geostrategic situation, marked by the end of the cold war era and the emergence of new space Powers, giving renewed impetus to international cooperation, and, on the other, a proliferation of space technology applications and a greater awareness of the effects that human activity has on our planet and its consequences.

3. In practice, space technologies are being increasingly called upon to help solve problems facing humankind in such areas as environmental management, communications, transport safety, natural resource management and the organization of disaster relief. We are also witnessing the implementation of mini-satellite or micro-satellite programmes, making it possible to reduce satellite development, launch and operating costs and thereby facilitate the access of a greater number of countries to space programmes.

4. Also, space-related activities are increasingly becoming part of the economic sector. The development of innovations is being undertaken with the constant concern to demonstrate the competitiveness of space-based solutions and those activities are being carried out to an ever greater extent within the sphere of private enterprise.

5. The work of UNISPACE III should not, however, be confined to a review of such developments and their implications; it should also consider how the new trends can be applied for the benefit of the greatest number and of the peoples of the developing countries in particular.

6. Those developments have been taken into account in the approaches adopted by France, which is one of the Powers actively engaged in furthering the peaceful uses of outer space, primarily in support of economic development:

(a) France has from the outset sought to incorporate a substantial part of its space research programmes within a framework of international cooperation focusing exclusively on peaceful activities. In particular through the Centre national d'études spatiales (CNES), it currently plays a major role within the European Space Agency (ESA), which is making Europe a leading space Power, in particular in the field of launcher vehicles of the Ariane series, in the satellite field, in the field of ground equipment through the creation of a space

industry of international dimensions and in the area of advances in scientific knowledge (science of the universe, Earth sciences and environmental science);

(b) Both within ESA, where it is the major contributor, and also on a national level, through CNES, France is directly involved in many programmes in cooperation with the other space Powers;

(c) France, which pursues an active policy in support of development, would like greater attention to be accorded to the use of space technologies for development purposes, so that an increasing number of countries will be able to take advantage of those technologies in their own economic and social development.

7. With regard to French space policy, five priorities have been adopted. The aims of those priorities, which are being implemented primarily under the responsibility of CNES, are to develop new applications and meet users' expectations:

(a) Adaptation, with its partners within ESA, of the Ariane-5 launcher to market developments, in terms of cost and performance, in order to preserve European autonomy of access to space;

(b) Development of a new generation of optical or radar-based Earth observation satellites and advancement of scientific research work on data interpretation in order to reduce costs and maintain Europe's strong position in this sector;

(c) Improved knowledge of the solar system, with emphasis on the planet Mars and the Mars sample return mission in cooperation with the National Aeronautics and Space Administration of the United States of America; this extremely ambitious mission should have important consequences in the area of Earth sciences and studies on the origins of life;

(d) Support for the economic development of the satellite location and telecommunications sector, in particular through private initiative project partnerships, the European satellite navigation and positioning system project and distance learning and telemedicine activities;

(e) Development of a major research and technology programme with a view to designing and validating new systems and maintaining independent expertise.

8. France also attaches importance to space technology in its development cooperation policy, which is being pursued on a multilateral basis or through bilateral projects. In particular, France has undertaken activities in the areas of training for the benefit of developing countries and assistance for countries wishing to embark on space activities. The efforts of the developed countries should be focused essentially on strengthening the technical expertise of national and international development organizations, on promoting research in the fields of the environment and global change and on furthering space applications in disaster prevention and mitigation. In this last area, greater and coordinated use of available satellite resources is necessary.

9. Over the last decades, the United Nations, through its Committee on the Peaceful Uses of Outer Space, has shown itself to be the appropriate forum for debating issues relating to the exploration and use of outer space. It is within this body that universally accepted legal norms have been successfully drawn up to form present-day space law.

10. It is also within this body that, in response to the new challenges posed by the development of space activities and technologies, work on defining new rules should be conducted in the future. The needs in this connection are genuine ones, whether they relate to improving the registration conditions, to limiting the production of space debris, to the intellectual property regime, in particular in connection with the operation of the international space station, to responsibility for positioning, navigation and time-tagging signals emitted in space from satellites or to space-related commercial activities. These few examples reflect

issues of common concern that should be addressed in a global forum, where every State has the right to be heard. France believes that space law should remain a multilateral law. The Committee on the Peaceful Uses of Outer Space should accordingly resume its role as the main body for defining common rules that meet common needs.

11. The Committee will be all the more able to discharge its function effectively if it can agree on arrangements that satisfy the expressed needs of the international community. We should therefore reflect on the method of functioning of the Committee, and especially of its Legal Subcommittee, and consider ways and means of tailoring its agenda to the real issues at stake, in line with the mandate of our international organization.

12. France will for its part continue to strive for the future advancement and development of space law as a component of international law. It will continue to cooperate fully over the coming years, as it has done in connection with the preparations for this Conference, in order to ensure that the results achieved with regard to the main economic, social and cultural interests involved in the use of outer space can be applied for the benefit of all.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

Vienna
19-30 July 1999

Abstract of the national paper of China

1. As early as in the most ancient times, China, a country with a long-standing history of civilization, had placed on record its world famous "four inventions" in the annals of world science and technology. Subsequently, ancient rocket technology was developed in China, pioneering the exploration of space. Since the founding of the People's Republic of China, great strides have been made from scratch in China's space science and technology and its applications, which have played a significant role in the modernization and construction of the country.

I. Development of space science and technology and its applications in China

A. Space science

2. Microgravity research in China started in the late 1980s. At present, complete systems for ground-based simulation experiments, short-term microgravity experiments and space experiments exist on a certain scale. A highly qualified professional team for laboratory research, theoretical analysis and numerical value simulation has been formed. Microgravity research in China is focused on applied basic studies and a number of results have been achieved in the fields of fluids under conditions of microgravity, space material science, space life science and biotechnology. For instance, many research experiments have been carried out in space on board China's own retrievable satellites: an α-LiIO3 growth experiment of transparent crystal in fluid under low temperature in space; a growth experiment of GaAs monocrystal of major diameter in space; an experiment with palladium silicon material on board satellites; and an experiment on the Marangoni convection effect based on co-crystal alloys. A device capable of recording the whole process of space experiments has been developed for real-time observation of growth in space, which has successfully recorded images of the whole process of liquation, liquefaction and crystallization of oxide crystalline materials. Other experiments include research on signature characterization of melting surfaces and interfaces between solids and liquids in space; profiling of the moisturizing properties of melting materials and their response at the liquid/solid interface; and the solidifying behaviour of metal alloys and compound materials in space. Research on processing methods, techniques and applications of bio-materials in space has prepared the basis for space pharmacy. Meanwhile, studies are also being conducted on biological effects in space, in search of new technologies and new thinking for regulating the process of life in space and obtaining new bio-materials.

3. China started its exploration of the space environment by means of rockets and balloons in the mid-1960s. In early 1970s, exploration of and research on the space environment and its effects was begun on board satellites. Dozens of probes and sensors on board satellites for investigation of the space environment and its effects have been developed. Space environmental exploration and research has been carried out on energy electrons, protons, heavy ions and their single particle effects, radiation dosage effects, space thermal plasma, upper atmospheric density and components and solar energy electromagnetic radiation. In the field of space astronomy, China has also conducted ground-based observation of and research on the fine structures of the solar magnetic field, as well as research in solar physics and the solar-terrestrial space environment.

4. In support of the Solar-Terrestrial Energy Programme to enhance human understanding of the relationship between the Sun and the Earth, the China Natural Science Foundation initiated research on the energy transmission process of the solar-terrestrial system, which achieved important results in understanding the correlation between solar activities and instantaneous interplanetary changes, the coupling of inter-planetary solar winds and the magnetosphere and the terrestrial-space coupling system.

5. China's scientific communities in astronomy have made new breakthroughs in developing ground-based systems to explore the solar magnetic field. A two-dimensional simultaneous spectrometer has been invented and the development of ground-based equipment such as telescopes for solar magnetic field observation and multi-channel solar telescopes as well as airborne equipment of 80 cm in diameter has culminated in success.

6. China's research in the field of carrying capacities on balloons and support technologies for monitoring and control has expanded the application of balloons in space science. China has manufactured and successfully launched scientific balloons in the size range 300,000-400,000 m^3 with a maximum payload of 2,000 kg. Each year 5-10 scientific balloons are released. Microgravity research has been carried out with falling capsules from balloons and valuable results have been achieved in microgravity combustion and electro-fusion of plant and animal cells.

B. Space technology

7. China started its development of launch vehicles in 1965 and successfully launched the DFH-1 satellite into space in 1970 for the first time with its own CZ-1 rocket. Today, CZ rockets have formed their own series, capable of launching into space domestic and foreign satellites for various purposes and of various dimensions. By the end of 1998, 55 launches had been made with rockets of the CZ series; since 1996, the CZ series has made 13 consecutive successful launches. Since 1985, when it entered the international market, the CZ series has succeeded in launching 23 foreign-made satellites into space.

8. China has developed and launched more than 40 satellites of different categories. Among them are retrievable scientific experiment satellites that are in the front rank of advanced technologies in the world, communication broadcasting satellites that have reached the level of medium capacity and geostationary meteorological satellites that have attained the international standards of the early 1990s.

C. The Application of Space Science

9. There are 20 specialized and 15 regional remote sensing centres in China. Some 80 per cent of more than 100 digital imaging systems are devoted to the processing of remote sensing data. China has successively developed aerospace remote sensing platforms, sounding balloons, sounding rockets, ground equipment and digital gathering platforms, constituting a

comprehensive geo-monitoring network at multiple levels. For the purpose of aeronautic remote sensing, China is equipped with finely scaled multi-spectral scanners, multi-spectral imaging spectrometers, side-view synthetic aperture radar and radar altimeters, which form a ground-based, airborne and space-borne all-weather real-time monitoring system in coordination with satellite platforms.

10. Meta-data on nationwide and provincial land use have been completed with multi-spectral images from Landsat and surveys have been carried out with the help of land survey satellites on land use, water resources, forest resources, changes in poor land and land planning in some areas. The productivity of farm products such as winter wheat, corn and rice has been assessed by means of remote sensing. Some typical models for application have been built. Research on improvement of existing models of crop growth monitoring by remote sensing has been conducted drawing on high-resolution spectral data and multi-angle monitoring of crop growth. In the area of geological map configuration, the combined working methods of remote sensing technology and large-scale multi-picture surveys have reduced the actual costs by one third and the length of field survey routes by about one half compared with conventional methods. Remote sensing technology has also been applied in archaeology, prospecting, railway and highway construction and marine information services.

11. As a country that suffers from frequent natural disasters of various kinds, China incurs annual losses of about 100 billion yuan through calamity damage. China places special emphasis on environment and disaster monitoring with remote sensing technology and the Geographic Information System. Application of the Global Positioning System has evolved from local engineering projects to nationwide coverage, forming a new generation of geodetic framework and a comprehensive GPS service system.

12. In the late 1980s, meteorological services in China began to use ground-based systems for processing data received from meteorological satellites. As a result, the utilization of data from satellites has evolved from image analysis of a subjective and qualitative nature to quantitative extraction of meteorological parameters. Monitoring typhoons and analysing and forecasting storms with the help of meteorological satellites have led to positive social and economic benefits.

13. In China, tele-education is the field in which satellite technology has been most widely applied and is developing the fastest. There are currently nearly 20,000 cable television stations in China, 70 per cent of which are transmitting China's educational television programmes. Over 1 million students are enrolled in tele-education universities, among which 39 are classified at the national and provincial levels, while 577 are at the municipal and local levels, thus constituting a tele-educational system with nationwide coverage.

14. Communication network systems in China consist mainly of fibre optics, supplemented by microwaves and satellites. More than 23,400 two-way domestic routes and 25,000 international routes via communication satellite are available. In the field of finance, network structures of bank headquarters and their primary branches have been developed in China through data transmission via satellite. Stock exchanges have also set up their own remote terminals.

15. Very small aperture terminal communication systems open to the public have entered into operation in China one after another, offering data transmission services in ticketing for civil aviation, maritime forecasting, earthquake monitoring, financial information, market quotations of securities and futures, as well as in customs, petroleum and railway operations, improving communications in remote areas.

II. Vision of future space activities in China

A. Future space science

16. Development of common hardware equipment for space fluid experiments is expected to be completed by the year 2000. The programme of telescopic observation of the solar magnetic field will be continued to allow observation of and research on the fine structures of the solar magnetic field using a specialized telescope of 80 cm in diameter. Falling capsules of high quality from balloons for microgravity scientific research will also be developed.

17. Cultivation and investigation of animal and plant cells and their organic blocks will be undertaken through international cooperation. During short-term microgravity experiments on board aeroplanes, research will be conducted on the correlation between the electrophoretic direct current field and the variable gravity field with electrophoretic instruments for continuous free current stream in space and equipment for life science experiments on manned space missions will be developed and relevant scientific research initiated.

18. During the solar maximum year, a mission of double star terrestrial space exploration will be implemented to investigate the impact of changes in the plasma environment in terrestrial space on solar activities, inter-planetary perturbations, the dynamics at magnetopause as well as the global response process of magnetic storms and substorms, so as to build physical models of magnetopause and models of other relevant changes, contributing to the development of solar terrestrial space physics at the beginning of the next century.

19. Research work on large-calibre solar telescopes will be pursued further and a new generation of the FY-3 polar orbit meteorological satellite will be launched to improve satellite weather bulletin service further.

B. Future space technology and its applications

20. Focus will be placed on the development of application satellites for communication and broadcasting, Earth observation and so on. Research will be carried out on the development of large geostationary bus platforms, large-capacity communication satellites, television direct broadcasting satellites and data-relay satellites to establish a satellite communication network that covers the whole country and the surrounding areas and is operated autonomously and on a regular, long-term basis.

21. On the basis of the construction of small modern satellite bus platforms and breakthroughs in small satellite constellation technologies, small satellites or constellations of them will be developed to constitute a fairly comprehensive network of application satellites in accordance with the actual needs of China's national economy.

22. Efforts will be made (a) to develop and establish a meteorological satellite series consisting of geostationary satellites and polar orbit satellites; (b) to develop and establish an Earth resource satellite series consisting of Earth resource satellites and (a cluster of) small Earth observation satellites; (c) gradually to set up a comprehensive system of Earth observation satellites for resource, meteorological, marine, environment and disaster monitoring; and (d) to establish and further improve a comprehensive application system of satellite remote sensing, with capabilities for medium- to long-term forecasting, processing and assessing under all weather conditions and at all times for resource exploration and environmental and disaster monitoring.

23. Use will be made of domestic and foreign navigation and positioning satellite systems to promote their application in civil aviation, roads, railroads, water transport, maritime transport, finance, agriculture, mapping, tourism and security defence. China will build its own

high-accuracy satellite navigation and positioning systems in due course to allow the gradual emergence of an application industry for navigation and positioning technologies.

24. Efforts will be made to enhance the reliability of the existing Long March (LM) series of launch rockets and to expand and improve their launching capacities. Costs for their development, production, launching and operation will be brought down, while launching services will be improved. Research will be carried out on new types of launch vehicle and new generations of launch instrumentality will be developed. Research will also be undertaken at an appropriate time on reusable space launch vehicles, while launch vehicles for small satellites will be developed.

25. Manned space flight will be undertaken as appropriate. Deep-space exploration and space technological experiments will be conducted on a limited scale. Efforts will be made to develop China's space laboratory and to conduct manned space exploration and operate a technological space laboratory through international cooperation at an appropriate time.

III. International exchanges and cooperation

26. The Government of China maintains that exploration and utilization of outer space should be in conformity with the international law and based on the principles of peaceful purposes, equality, mutual benefit, free competition and mutual development. International cooperation in the peaceful uses of outer space should be enhanced and promoted. The role of the United Nations in developing the international space law and strengthening the legal order in space should be brought into full play.

27. China is a member of the Committee on the Peaceful Uses of Outer Space and a State party to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, the Convention on International Liability for Damage Caused by Space Objects and the Convention on Registration of Objects Launched into Outer Space. National legislation on space is also under preparation in China.

28. Having signed bilateral and multilateral cooperation agreements with more than a dozen countries, China has established long-term cooperative relationships and carried out cooperation in various areas. The Government of China will strive to expand its cooperation in space with other countries of the world so that space technology can serve the benefits of mankind to a greater and better extent.

29. Being a developing country with a vast territory, a varied topography, a large population and a weak economic foundation, China is confronted with a tremendous challenge of modernization and construction, and space technology, as one of the most sophisticated technologies in the contemporary world, is not only a representation of the overall national strength, but also an important means to transcend the phase of traditional development and accelerate economic and social development. The Government of China will continue to encourage and support the development of China's own space activities.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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19-30 July 1999

Abstract of the national paper of the United Kingdom of Great Britain and Northern Ireland

1. The British National Space Centre (BNSC) is a partnership body that brings together the United Kingdom's space effort, embracing Government, industry and the academic community. Its objectives are set out in a national plan, the latest edition of which will be issued shortly following wide consultation with British industry and the scientific community.

2. The United Kingdom's space activities contribute to a number of the Government's broader aims. These include:

(a) Increasing quality of life through the application of new technologies;

(b) Encouraging sustainable development by monitoring and protecting the environment and developing new business processes; and the pursuit of new knowledge;

(c) Enhancing educational capabilities by building on strengths in the science and engineering base.

3. The Government invests some £200 million per year in civil space technology and services. Of this £90 million is committed through the Department of Trade and Industry's industry budget and £55 million through the Office of Science and Technology's allocations to the Particle Physics and Astronomy Research Council and the Natural Environment Research Council. Other investors include the Ministry of Defence in operational meteorological satellite systems, via the Meteorological Office and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), the Department of Transport, Environment and the Regions in climate data and the Department with UK National Air Traffic Services in satellite navigation.

4. Within its space policy, the Government has identified a number of industrial and scientific goals:

(a) To foster the development of innovative technology and its application in research and in commercial exploitation;

(b) To pursue the highest-quality astronomy and space science;

(c) To improve understanding of the Earth's environment and natural resources;

(d) To help industry maximize profitable business opportunities in the development and exploitation of space systems that improve the quality of life and enhance choice for consumers;

(e) To communicate those objectives and their significance to a broad audience.

5. The civil space community in the United Kingdom consists of about 6,500 employees in industry, about 500 academic staff and a similar number of postgraduate students in some 40 universities. In addition, the partners in BNSC employ around 400 people. The United Kingdom is the largest user of commercial space after the United States of America and the Russian Federation; the space-derived output of United Kingdom scientists is at least 10 per cent of the world's output of similar science, ranking second only to the United States. Public interest in space, measured in terms of media coverage, has increased dramatically. The United Kingdom's space industry turnover is growing at 10-15 per cent per year and now stands at around three and a half times the government civil space programme, a reflection of the United Kingdom policy of focusing on commercial opportunities in space.

6. The United Kingdom focuses on achieving its objectives as cost-effectively as possible. This is done through the BNSC partnership and by working in collaboration with others pursuing similar goals. Increasingly projects are co-funded with industry and potential service users in the better established and nearer-market areas of activity.

7. The United Kingdom has shared in Europe's space activities since they began more than 40 years ago. It was a founder member of the European Launcher Development Organization and the European Space Research Organization, predecessors to the European Space Agency (ESA). It welcomes moves by ESA to improve the competitiveness of the European space sector and to increase the role of the commercial sector in European space activity. About three-quarters of government spending on space is invested through ESA and EUMETSAT. The United Kingdom has also taken the lead in encouraging closer coordination between the space research programmes of the European Union and ESA. It is also a member of the Committee on the Peaceful Uses of Outer Space, the Committee on Earth Observation Satellites and other organizations.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Egypt

1. Egypt believes that outer space belongs to all peoples of the globe; that the benefits of space technology must reach out to all the world's population; and that the efforts of the Office for Outer Space Affairs of the United Nations Secretariat as well as the series of regional and international conferences, such as the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), are of great importance, bringing benefits for the peoples of the entire world. Egypt has taken part and will be taking part in all of the efforts related to making space technology and its applications and information concerning them available to the peoples of all States.

2. The present paper sums up the major issues Egypt focuses on in the field of outer space:

(a) Egypt is part of Africa and of the Middle East and it also belongs to the developing nations. Accordingly, and in that capacity, Egypt wishes to expand the scope of applications and the use of space technology in order to allow for the results achieved in the field of outer space and the benefits thereof to reach the least developed nations;

(b) Egypt is planning to implement an ambitious development programme aimed at bringing prosperity, and improved agriculture and housing to the people who live in the desert in the southern part of its territory. That programme would require large-scale expansion and development of agriculture and infrastructure in those remote areas and for that reason could benefit a great deal from space technology;

(c) Egypt has adopted a strategy entailing the development of its own scientific and technological potential as regards the space industry. Egypt believes in international space cooperation and that assisting developing nations to take their first steps in space technology could play an important role in enhancing the ability of those nations to make the benefits from advanced technology available to their respective peoples;

(d) Egypt therefore calls for the elimination or reduction of all the barriers and constraints that preclude the transfer of advanced space technology to interested States and for the provision of aid to those States to develop their space programmes for peaceful purposes, thereby making possible the expansion of the scope of uses of space technology in the service of mankind;

(e) Egypt has been and still is particularly interested in developing a precise definition of the divide between the atmosphere and outer space over the territory of each State—this being one of the points of international law that has challenged the international community since the beginning of the space era and concerning which no satisfactory conclusion has yet been reached—in a manner that would ensure the States' interests, sovereignty and security

and would not disrupt the freedom of outer space and the uses of outer space in the interest of humanity as a whole;

(f) Egypt has been endeavouring to strengthen its ties with the space-developed States and, to that end, has signed and is about to sign a number of international cooperation agreements in space technology and remote sensing;

(g) As regards remote sensing, during the year 2000 Egypt intends to establish a ground receiving station for satellite images. This will lead to enhanced capabilities in remote sensing and will also provide speedier and cheaper access to satellite images and their use for development purposes;

(h) In April 1998, Egypt launched its Nile SAT-1 satellite for direct television broadcasting and is currently preparing to launch its second satellite, Nile SAT-2. The two satellites are to cover Egypt, the Arab States and the Middle East, allowing for Egypt's cultural message to reach out to all parts of the world.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Germany

I. German space activities

1. Space technology is regarded by Germany as an essential provider of infrastructures relevant to scientific, societal and economic purposes. Commercial applications are of growing importance in the global, European and national German perspectives. Satellites support numerous policy areas like mobility, information and knowledge, environmental and natural disaster protection, the management of natural resources or development cooperation. Space activities contribute in a unique way to the cultural, material and emotional enrichment of life. Space technology in Germany is no longer seen as mainly basic research.

2. Germany is following a two-pronged strategy in fostering space technology: seeking excellence in basic space science and fostering public-private partnerships in commercial applications such as satellite navigation, Earth observation and further development of launchers. Germany strives for the highest quality in the fields where it conducts space technology development. Core thematic areas are leadership in the European participation in the International Space Station and its multidisciplinary utilization, multimedia satellite technology, satellite navigation, support for the setting-up of commercial Earth observation systems, further development of the Ariane launcher and of re-usable space transportation systems, development of robotics and maintaining the leading position achieved in basic space science through scientifically rewarding and attractive projects.

3. Management responsibilities for publicly financed German space activities have been transferred under Federal law to the German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt (DLR), www.dlr.de). In that capacity, DLR drafts the German space strategy for adoption by the Federal Government, manages the space programmes and represents Germany in bilateral and European cooperation (with the European Space Agency (ESA)). DLR is also the national research centre for aerospace and provides technical and space operations infrastructure. It employs around 4,500 people.

4. On the industrial side, the German space industry comprises one large system manufacturer and a whole range of specialized companies, mainly small and medium-sized enterprises, producing subsystems and providing services in numerous space-related fields of technology. Space technology provides highly skilled jobs for about 55,000 individuals. The German space industry is organized in the German Aerospace Industry Association (Bundesverband der Deutschen Luft- und Raumfahrtindustrie (BDLI), www.bdli.de). Completing the German landscape of space activities are a large number of research and academic institutions such as the several Max Planck institutes and universities, but also specialized centres conducting research in basic space science (astronomy, planetary

exploration and microgravity research). German universities and research institutes provide training in space science and technology to students and scholars from all over the world, supported by an extensive scholarship scheme.

5. Germany has been active in space research and applications for more than 30 years and has spent around 15 billion euros (€) on publicly funded German space activities. These funds are subdivided into participation in ESA (1998: €560 million) and in the European Organization for the Exploitation of Meteorological Satellites (1998: €80 million), a national space programme (1998: €140 million) and research and operations activities of DLR (1998: €110 million). Germany currently spends about 70 per cent of her space programme budget on European programmes, thereby stressing both synergy effects and the political concept that the exploration and utilization of outer space is regarded as a joint European effort. Bilateral cooperation with numerous countries, in particular Japan, the Russian Federation and the United States of America and also developing countries such as Brazil, China and India, is channelled through the national German programme. German organizations for economic cooperation regularly use Earth observation data to achieve their goals in all parts of the world.

II. German position on UNISPACE III

6. Since becoming a Member State of the United Nations in 1973, Germany has been a member of the United Nations Committee on the Peaceful Uses of Outer Space and has contributed on a regular basis to its work on various subjects. Substantial support, *inter alia*, in the field of nuclear power sources and space benefits resulted in resolutions of the General Assembly in 1992 and 1996. Germany' s contributions to the discussions on space debris led to the election of a German as Chairman of the Scientific and Technical Subcommittee in 1996. Most recently, during the 1999 sessions of the two subcommittees of the Committee on the Peaceful Uses of Outer Space, Germany launched initiatives to restructure the agendas of the two subcommittees. Germany regards the Committee and its subcommittees as a major global forum for discussing technical subjects and further developing international space law. In Germany's view, the successful work of the Committee also relies on the Office for Outer Space Affairs, composed of a highly qualified, efficient and dedicated staff.

7. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) provides a unique chance to highlight the benefits of space activities for the whole world. Germany will focus its presentations and contributions to the Conference on applications of Earth observation (especially environmental and climate research as well as commercial systems and applications), basic space science, telemedicine (where a workshop in the Technical Forum is to be organized by DLR), navigation and meteorology (in the respective European frameworks), communications (in particular, multimedia applications) and space law.

8. As a result of UNISPACE III, the United Nations Programme on Space Applications should remain strong and become more focused. In particular, the regional centres should become the focal point for activities. Germany will, in coordination with ESA, concentrate its future participation in those centres. Another area of prime interest for the Office for Outer Space Affairs should remain the field of basic space science, where excellent success has been achieved. Germany will continue to support that activity. As a matter of priority, the Office should assist the special programmes and specialized agencies of the United Nations system as well as the action programmes (like the thematic decades) to take the fullest possible advantage of space applications in fulfilling their tasks and achieving their goals. UNISPACE III should therefore stress the promotion of space applications in the United Nations system.

9. In that context, Germany will offer the Committee on Earth Observation Satellites (CEOS) Information Locator System (CILS, www.cils.dlr.de), which has been developed under German leadership in the framework of CEOS, to the United Nations Environment Programme. CILS is a service aimed at meeting the requirements of Earth observation data users, in particular in developing countries. It will provide users with easy access to project information and to relevant auxiliary information on the practical use of Earth observation.

10. From the German perspective, UNISPACE III is an important step in deepening the universal understanding of space technology and of space-related applications. Space applications will have a considerable impact on human security, welfare and development in the twenty-first century.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Saudi Arabia

1. The national paper of Saudi Arabia to be submitted to the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) describes what Saudi Arabia has done in applying space technology at its best in communications, direct broadcasting, information exchange and remote sensing. Saudi Arabia has established the Space Research Institute at the King Abdul Aziz City for Science and Technology, whose aim is to promote the transfer, development and adaptation to local conditions of space technology for the purpose of developing human and natural resources in conformity with the country's ambitious development plans.

2. The paper summarizes Saudi Arabia's points of view concerning the importance of international cooperation in the peaceful uses of outer space, the transfer of technology and coordination among all States, both developed and developing, and its belief in the need for compatibility, complementarity and consistency between satellite systems and networks such that they provide for better use of space technology and thus contribute to the development, advancement and well-being of all States of the world.

3. The paper also describes the position of Saudi Arabia as regards the Conference, which causes it to look with optimism at the future peaceful use of space and to hope that the benefits of space will reach all the peoples of the globe; that all the resolutions adopted by the United Nations will preserve the right of all States to unrestricted use of space; and that international environmental studies will be based on objectivity, allowing all States, in particular those which are affected by such studies, to take part in them. Saudi Arabia also stresses the need to keep space out of the arena of nuclear tests and international conflicts and to preserve it from any action that could interfere with satellites or lead to their destruction.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Cuba

1. Space research in Cuba started in the 1960s with the establishment of scientific and university centres for the study of basic space sciences and the development and application of space technologies. There is now a pool of highly trained and qualified technical experts and research scientists who have quickly mastered the skills required for using the costly equipment procured through bilateral cooperation with various countries.

2. Successful research studies have been conducted and presented in numerous international forums and published in prestigious scientific journals. One milestone in that research was the joint Cuba-Union of Soviet Socialist Republics space flight conducted in 1980, during which over 20 scientific experiments were performed on board, yielding results of great value for medicine and industry.

3. With the collapse of the Soviet Union and the disappearance of the socialist camp, and with the increasing severity of the blockade by the United States of America against Cuba, space research and development work has been subject to considerable limitations. The existing facilities have nevertheless been maintained in operation and research is going forward in this sphere.

4. The National Commission for the Exploration and Peaceful Uses of Outer Space, which is attached to the Ministry of Science, Technology and the Environment and in which specialists from various Cuban institutions participate, was established in 1983 pursuant to a decree of the Council of Ministers.

5. Cuba has signed four of the five United Nations treaties on outer space. It is party to the United Nations Framework Convention on Climate Change and is engaged in research that, because of its importance, has been incorporated as part of the national programme entitled "Global Change and Sustainable Development in Cuba".

6. The country is a member of the World Meteorological Organization (WMO) and cooperates in furnishing timely information in connection with hurricanes. In the field of space meteorology, research is proceeding in the areas of multispectral and multi-temporal image analysis, in relation to the structure of tropical cyclones, and atmospheric temperature and humidity, on the basis of satellite and other images.

7. With a view to predicting, warning of and mitigating the consequences of natural disasters, there have been set up regional and national civil defence authorities, which have succeeded in substantially reducing mortality rates in connection with natural disasters.

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8. Cuba has been able, through remote sensing applications, to expand its national expertise in such key development sectors as agriculture, mineral prospecting and water and forestry resources. Nevertheless, the main obstacle to extensive use of the data from Earth observation systems continues to be the high purchase price of such data and of the facilities necessary for such purposes. One advantage in Cuba, however, is the availability of personnel who have the requisite technical expertise and professional competence and are qualified to undertake project management and research in this sphere.

9. It has been possible, through space research, to carry out major studies in a number of different fields, including, most notably, oceanographic studies to determine the surface temperature of the sea and the concentration of marine chlorophyll in connection with studies of fish ecosystems and global change.

10. In the agricultural sector, a low-cost integrated aerial system has been developed for the study and monitoring of agricultural resources, and satellite technology has been applied in crop planning and rotation.

11. Successful integrated geoenvironmental studies of various regions of the country have been conducted with a view to improving land use planning. In that regard, national software has been developed for processing satellite data.

12. Cuba has been involved in the development of laser telemetry since 1977 and, since 1992, under a bilateral agreement with Germany, the resultant data have been used in measurements of reference global terrestrial systems and the determination and monitoring of satellite orbits. Since 1995, Cuba has also been operating a global positioning system (GPS) station in accordance with the International GPS Service (IGS) standards.

13. Cuba is assisting efforts to strengthen cooperation in the sphere of communications and is accordingly a member of the International Telecommunication Union and WMO. Cuba is also a member State of the International Mobile Satellite Organization and is exploring the possibility of acceding to the International Telecommunications Satellite Organization Agreement.

14. In the area of basic space sciences, regular observations of the Sun, the ionosphere and the geomagnetic field are being maintained and the resultant data sent to world centres. Research is being conducted in the fields of astronomy and space geophysics.

15. Particular importance is assigned to cooperation within the framework of the United Nations and its Committee on the Peaceful Uses of Outer Space and other space agencies. The strengthening of regional cooperation for the development of space research is also a goal promoted by Cuba, as demonstrated by its participation in the three Space Conferences of the Americas, at which it presented proposals.

16. Cuba is also active in the promotion of cooperation in the area of space technologies and applications on the basis of the principles governing space exploration, with emphasis on the need for such cooperation to be directed towards achieving greater exchange among all, more effective utilization of space technologies by developing countries and the promotion of human development for the benefit of the world's peoples and protection of the environment.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Canada

1. Canada has a proud history in space. In 1962, Canada became the third country in space with the launch of Alouette-1. In 1972, Canada became the first nation to have a domestic, commercial geostationary telecommunications satellite system and, in 1976, the first to use direct broadcast satellite television. Having developed the Space Shuttle's Canadarm during the 1980s and the International Space Station's Mobile Servicing System during the 1990s, Canada has become the world's leader in space robotics. With the 1995 launch of RADARSAT-1, Canada developed the world's first and most advanced commercial radar remote sensing satellite system. And Canada has a large and experienced astronaut corps and undertakes world-class space science research and space technology development.

2. In all this and much more, Canada has pursued a bold and balanced vision of space. The dual objectives of the Canadian Space Program are (a) to develop and apply space science and technology to meet Canadian needs, maximizing the practical benefits Canadians derive from space-based products and services, and (b) to foster the development of an internationally competitive space industry and thereby contribute to Canadian prosperity.

3. The Canadian Space Program pursues these objectives by:

(a) Strategically targeting Canadian space investments towards niche sectors and capabilities in areas such as space robotics and automation, radar remote sensing and advanced satellite communications, which maximize industrial return and the public good and in which Canada can maintain a global lead;

(b) Working through innovative partnerships with the private sector as part of an industrial commercialization strategy that appropriately balances the roles of the public and private sectors;

(c) Structuring Canadian programmes around cooperative international partnerships and creating synergies between Canada's space investments and those of other countries;

(d) Fostering excellence and creativity within our scientific community to advance knowledge for the benefit of all Canadians;

(e) Promoting scientific literacy among Canada's youth and supporting a science and technology culture in Canada through a national communications and space awareness programme.

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4. Canada's future in space will be equally proud. Building on the achievements of the past, the Canadian Space Program has recently been organized around five areas: Earth and Environment, Space Science, Human Presence in Space, Satellite Communications, and Space Technologies. The new space programme will expand Canadian capabilities in niche areas of remote sensing (through follow-on RADARSATs and applications development), space robotics (e.g. through planetary robotics missions), satellite communications (through advanced communication technologies) and space science (through a number of ground-breaking programmes). The new plan will extend further Canada's space partnerships between government and industry and between Canada and its international space partners. And it will lay the groundwork for ever greater advances in space science and ever greater use of space technology and applications for the benefit of Canadians and humanity in general.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

Vienna
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Abstract of the national paper of Colombia

I. General

1. Like most developing countries, Colombia is a user of space technology and it is in that context that the paper presented reflects the concerns of the country, which views one of its main priorities as the strengthening of international cooperation and support for technology transfer, as well as the development of human resources to achieve more effective utilization of space technology and its applications.

II. Use of space technology and its applications

2. Colombia uses space technology applications in its continuing endeavours to improve the quality of life of its citizens, to which end it has fostered research on the Earth and its environment with a view to preventing natural disasters or mitigating their consequences. Space technology is similarly used in the monitoring of environmental hazards, analysis of coastal areas and forecasting of climate change so that the data obtained can be used for planning purposes to ensure rational land use and management, optimum utilization of freshwater resources and the development of production capabilities in the agricultural, livestock, forestry and fisheries sectors.

3. Likewise, the knowledge yielded by space technology applications is used in the management and planning of resources to ensure their proper utilization and to ensure that this in turn is translated into genuine progress for the development of the communities that are the focus of social advancement programmes.

4. A further area in which Colombia has achieved substantial progress is the use of space technology in the operation of navigation and positioning systems, for the purpose of substantially improving air safety and hence better utilization of national airspace, thereby fully exploiting its potential and enabling aircraft using routes over Colombian territory to take better advantage of the country's geographical location.

III. Social development

5. In addition to the above-mentioned areas, a further area that uses space technology applications and has a real impact on social development is local telephone services. This is one of the most rapidly progressing and developing national sectors and signifies a major extension of satellite communication coverage, providing communities with a greater range

of local telephone and radio services, which have been used, for example, for communications to and from regions hit by natural disasters, with a consequent improvement in the utilization of the resources assigned to disaster management.

6. Other sectors in which space technology advances have been introduced and used are the following: cartography, agrology, geography and land registration. The studies carried out in those areas have all contributed to a better understanding of the real conditions prevailing in the country and have led to the adoption of better focused development plans and strategies, which in turn have improved the management of physical, human and financial resources and have guaranteed their rational use, while also yielding a corresponding increase in productivity.

IV. International cooperation

7. Colombia is paying particular attention to this area, but has not made any major progress, mainly because of the high cost of space technology and its applications and the conditions for their marketing, which, added to other factors, form barriers preventing the developing countries from benefiting from the advances made worldwide.

8. For these reasons, Colombia wishes to submit the following initiatives aimed at overcoming these obstacles:

(a) Upgrading of international and regional databases with a view to allowing them to be consulted electronically;

(b) Diversification of international cooperation arrangements;

(c) Establishment of a mechanism enabling the different regions to adopt a coordination strategy and harmonized workplan, protecting the interests of the developing countries;

(d) Application of the principle of equitable access to the assignment of frequency bands and the geostationary satellite orbit, account being taken of the needs of developing countries and the geographical location of particular countries;

(e) The incorporation in international programmes involving space technology of a strong commitment to provide training and resources for the participating institutions;

(f) Establishment of financial cooperation programmes—including multilateral bank credits—for the procurement of equipment and construction of facilities for space technology research and development and related applications.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Malaysia

1. In view of the immense benefits of space technology and its tremendous potential impact on all aspects of life, Malaysia is committed to the development and advancement of space science and technology applications.

I. The Earth and its environment

2. Utilization of Earth observation data in Malaysia dates back to the 1970s. To date the data have been used for planning, management and monitoring of natural resources and the environment. Other fields of application include land use, agriculture and meteorology. A ground receiving station that will receive real-time data directly from major international satellites is currently under construction.

3. Studies of the Earth's atmosphere have been carried out by several universities and government agencies. Of note is the work on the ozone layer and the regional haze caused by forest fires.

II. Satellite communication and global positioning

4. In 1996 Malaysia launched two telecommunication satellites, Measat-1 and 2, under the aegis of a private company. The design of Measat-3 is currently under way. Satellite communication is also provided by several other local companies through rental of transponders on or partial ownership of other international satellites.

5. The commercial utilization of the NAVSTAR Global Positioning System (GPS) is currently limited to a few transportation operations. Its use for mapping, scientific studies and recreation is rapidly on the rise. Global positioning represents the largest potential commercial utilization of space technology in Malaysia.

III. Small satellites

6. Malaysia has built its first microsatellite, TiungSAT-1, in collaboration with the United Kingdom of Great Britain and Northern Ireland. Named after a variety of a singing mynah bird, the satellite will operate on amateur radio frequencies and has remote sensing capability. It also carries a cosmic energy deposition experiment. The satellite awaits a piggyback launch in September 1999 aboard the Zenit-2 rocket. The launch has been much delayed owing to the unavailability of affordable launch opportunities for small satellites globally.

7. In view of the great potential for applications and the affordability of small satellites, Malaysia is committed to research on and development of such satellites and to exploiting its advantages in new ways. The design of a second microsatellite is now under way.

8. It should be mentioned that the scarcity of launch opportunities for small satellites will ultimately curb the usefulness of such satellites. Similarly, expensive launches will negate the affordability of small satellites and limit the number of countries that will develop and advance small satellite technology.

IV. Training and education

9. Space science is part of the formal science curriculum at both the primary and secondary school levels in Malaysia. Three tertiary institutions offer astronomy and astrophysics courses. The country has three planetariums, while one is in the planning stage. Aerospace engineering courses are offered by four tertiary institutions, three of which carry components related to space engineering. Scientists and engineers continue to be sent for training in space science and technology at overseas universities.

V. International and regional cooperation

10. Malaysia adopts an open policy of science and technology collaboration. In the field of satellite technology, cooperation has been forged with Brazil, India, the Republic of Korea, the Russian Federation, South Africa and the United Kingdom of Great Britain and Northern Ireland. Future programmes are expected to involve the United States of America, Australia, France, Germany, Italy, Japan, Singapore and some African countries.

11. Strong links have already been established with members of the Association of South-East Asian Nations in remote sensing in the aspects of training and development. Bilateral projects have been implemented with the European Space Agency/European Union, Canada, China, Japan and the United States.

12. International cooperation and joint ventures have been instituted by the country's satellite communication service providers. These international ventures include, among others, the International Telecommunications Satellite Organization, the International Mobile Satellite Organization, Iridium and ORBCOMM.

VI. Closing remarks

13. Aware of the fact that Malaysia is a new participant in the space arena and conscious of the limitations of its resources, Malaysia will actively seek international cooperation in all aspects of space activities while at the same time vigorously nurturing its own indigenous capability.

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Abstract of the national paper of India

A. Current status of the Indian space programme

1. The Indian space programme was born out of a vision of developing and utilizing modern space technology in order to accelerate the socio-economic development of India. From modest beginnings in the 1960s, the national space programme has grown over the period of the last three decades into a full-fledged one. That development followed a step-by-step process involving creating the necessary infrastructure, conducting unique demonstration missions in space applications, building experimental spacecraft and developing launch vehicles.

2. The Indian space programme at present encompasses a wide spectrum of activities, including building state-of-the-art satellites and launch vehicle systems, execution of large-scale application projects in participation with the users and industry and pursuit of activities in the space sciences. Currently, five satellites in the Indian National Satellite System (INSAT) series are providing operational services in telecommunications, television broadcasting, meteorology and disaster management. Further, five satellites in the Indian remote sensing satellite series are providing data for a variety of applications in natural resource survey and monitoring. The polar satellite launch vehicle, which can place satellites of some 1,200 kg in polar sun-synchronous orbit, is now operational. The development of a geosynchronous satellite launch vehicle is being undertaken to assist in launching the INSAT class of spacecraft into geostationary orbit. Since the inception of the programme, India has launched 29 satellites, of which 25 were built in India. Thirteen space launches have been made from Indian soil using Indian launch vehicles.

1. Organization

3. In their early phases, space activities in India were guided by the Indian National Committee for Space Research (INCOSPAR). The Indian Space Research Organization (ISRO) was set up in 1969. In 1972, an independent Department of Space under a Space Commission set up by the Government of India took charge of ISRO and is now responsible for the country's space programme. The Space Commission formulates policy and approves major programmes. In order to ensure effective application of space technology, innovative organizational mechanisms were created that involve users in the planning and application process. Through several centres spread out in various parts of India, the Department of Space and ISRO undertake research and development as well as operational space missions, an

applications programme and human resource development activities. About 180,000 persons are working at ISRO, whose current annual budget is of the order of $300 million. Around 90 universities and academic institutions have participated in the space efforts and more than 500 small, medium- and large-size industries have made valuable contributions. The Department of Space established the Antrix Corporation in order to promote the commercialization of space and to market Indian space capabilities on the global market. Efforts are continuing to encourage greater participation of industries in the public and private sectors in commercial space activities.

2. International cooperation

4. International cooperation has been the hallmark of the Indian space programme, which maintains extensive cooperation with several space agencies around the globe. India has been participating in and contributing actively to all relevant international forums, including the United Nations and its specialized agencies, the International Astronautical Federation, the Committee on Space Research, the Committee on Earth Observation Satellites and others in order to promote international cooperation in this field. Cooperative flight opportunities for instruments developed by other countries, extending the use of research facilities and exchanges of scientists and scientific data were pursued in the past.

5. India has been operating a programme for sharing experience with other developing countries, which provides opportunities for training in space applications for persons from other such countries.

6. The Centre for Space Science and Technology Education in Asia and the Pacific was established in India in November 1995 and is affiliated with the United Nations. The Centre provides high-quality education in the fields of remote sensing and geographic information systems, satellite communications, meteorology and space science. Since the beginning of the programme in 1996, 126 students from 25 countries have benefited from such training. Given that similar centres have evolved at the instigation of the United Nations and that they will constitute important vehicles for capacity-building in developing countries in different regions, international funding assistance for sustaining such centres should be encouraged and provided for.

7. India is also strongly committed to the role of the United Nations in the promotion of international cooperation in space and is party to all the treaties developed by the United Nations. India considers that the United Nations should continue to play its role in the further development of international law to ensure that further exploration and the peaceful use of outer space are implemented in the interest of all countries and that outer space is maintained as a common heritage of all humankind.

3. Future directions

8. The vision that has driven the Indian space programme since its inception will continue to guide its future course. The major directions for the future will be:

(a) To undertake further development of the space sector in space in order to make it a powerful tool for social and economic transformation of the nation, in the context of entry into the next millennium;

(b) To enable national industries and the commercial sector to develop further in order to cater to national needs as well as to compete on the world market;

(c) To develop new applications that take advantage of technological advances and cater to the priority needs of Indian society;

(d) To strengthen delivery systems for large-scale societal applications of space technology;

(e) To strengthen international cooperation in order to maintain space as a common heritage of humankind, to promote global peace and welfare, to profit from the benefits of space in a just and equitable manner, to protect the environment of the Earth and space and to serve broader humanitarian needs;

(f) To strengthen research and development in areas relevant to the overall goals of the programme and to pursue greater efforts towards human resource development.

B. Indian perspectives on UNISPACE III

9. India considers that the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) is a unique opportunity for the global community to assess and strengthen cooperation in the field of exploration and peaceful uses of outer space, taking into account the significant changes since the Second Conference, held in 1982. Rapid advances in technology, growing awareness of the need to preserve Earth and its environment, the increasing potential offered by space activities for economic and social benefits vis-à-vis the urgent needs of the developing countries and the changes in the global political scene during the post-cold-war era are sound reasons to deliberate on the role of space in the development of humanity in the twenty-first century.

10. Space based remote sensing has been making immense contributions to the solution of various problems relating to the sustainable use of natural resources and has also generated valuable information relevant to the protection of planet Earth. It is essential to ensure continued availability of remotely sensed data, which are now available from many satellites. Equally important is the need to ensure that such data are made available at an affordable price to users. While technological advances are leading to the availability of data of higher resolutions, the necessary mechanisms need to be established to harmonize policies concerning access to data with the national interests of Member States.

11. India considers that the integration of environmental and developmental concerns is essential for the fulfilment of basic needs and ensuring improved living standards for all, better protected and managed ecosystems and a safer and more prosperous future. It is essential to ensure effective coordination of activities among Member States and international organizations so as to enable all countries to use space technology effectively for the purpose of protecting the environment, while at the same time promoting the sustainable exploitation of natural resources.

12. In view of the continuing need to protect humanity from the impact of natural disasters and of the fact that various national and international organizations and agencies have collected enormous amounts of data from space platforms and have successfully completed a number of related studies, it would be appropriate to initiate an integrated global effort as regards disaster management using space systems. The feasibility of setting up an international disaster monitoring satellite system, as a multilateral cooperative effort among various interested nations, should be explored.

13. India recognizes the crucial role of space systems in achieving much-needed human connectivity. In view of the immense potential of space systems to transform societies through distance education and developmental communications, in particular in the developing world, it would be worthwhile to initiate global efforts to create the required awareness among decision makers as well as to ensure effective and synergetic utilization of various space systems in that regard. While promoting commercialization in the field of satellite telecommunications and broadcasting, it is also necessary to ensure that the international

policy framework and regulations should ensure equal opportunity and access for all and take into account the interests of countries with different levels of development.

14. India recognizes international cooperation and strategic alliances as integral elements of space efforts. The cardinal principle underlying international cooperation has to be to complement and/or supplement the capabilities and capacities of Member States so as to enable them to take advantage of advances in space technology development and utilization. It would be appropriate to initiate steps to build a global fund, based on contributions from developed countries and major commercial operators, that would provide assistance to the developing countries for the fullest exploitation of peaceful benefits from space. Such a fund could also be used to support research and development activities in the areas of the space environment, removal of space debris and so an.

15. The significant increase in space efforts across the globe has brought with it an associated increase in space debris. It is essential to strengthen the ongoing efforts to ensure that outer space is protected and managed as a common heritage of mankind. A fund could be formed from contributions, proportional to the level of utilization of outer space by the different space agencies and other users, to support and strengthen research and development activities in that regard.

16. The widespread development of peaceful uses of outer space by all countries will be possible only with unhindered access to technology and knowledge on a global basis. Global cooperation in that regard should be further strengthened in order to remove impediments to access to technology, equipment, materials and knowledge for use in peaceful and developmental activities.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Iraq

Peaceful use of space technologies in Iraq: under United Nations embargo, a problem to be solved

I. Introduction

1. Iraq is a founder member of the United Nations and was one of the first countries to join many of its scientific organizations and committees. It had an active presence in meetings, functions and conferences relating to space activities and space research in the past. Iraq had ambitious programmes for space research and applications, but with the state of embargo imposed on Iraq for the past nine years, a large knowledge gap between Iraq and the rest of the world has been created, with academic and scientific activities greatly reduced and participation in international conferences and meetings practically diminished.

2. It is regrettable that very little scientific research in general and space research in particular is currently being conducted in Iraq. Acquisition of scientific papers and technical information is extremely difficult, if not impossible, training opportunities are scarce, if not completely denied to Iraq either deliberately by some countries or because of the lack of hard currency. In spite of these difficulties, however, some activities are still being carried out.

3. Continuation of those activities and other scientific and technical functions are essential for the welfare of the people of Iraq and international assistance and cooperation are much needed.

II. Telecommunications

A. Status before 1990

4. Before 1990 Iraq used to have four main satellite Earth stations, of which two operated, in coordination with the International Telecommunications Satellite Organization, in conjunction with satellites located over the Atlantic and Indian Oceans. One operated with the International Organization of Space Communications (INTERSPUTNIK) satellite system and one with the Arab Satellite Communication Organization (ARABSAT) satellite system.

Between them, the four satellite Earth stations connected Iraq with numerous telecommunication centres around the globe.

5. The total capacity of the system was equivalent to more than 700 analog telephone channels providing reasonable telephony, facsimile and telex services that were just about adequate at the time.

B. Future plans as of 1990

6. Despite the borderline adequacy of what existed in 1990, Iraq had very ambitious plans to modernize its satellite communication infrastructure by changing completely to digital systems and adding new systems that were to be completely up to date at the time. The transfer from the old analog frequency division multiplexing/frequency division multiple access (FDM/FDMA) system to its new ADR digital successor was the first task at hand. A contract was under serious negotiation with a number of European and Japanese companies. In addition, Iraq was seriously considering the use of a national domestic satellite system to fulfil the needs of television and audio programme distribution and general telecommunications throughout the country. One of the prime uses of such a system was planned to be tele-education and learning and anti-illiteracy campaigns.

7. Iraqi plans in the domestic satellite area were twofold. The first was to rent one or two satellite transponders aboard one of the international or regional satellites that cover Iraq. The second was to acquire and put into orbit a national satellite of its own. For that purpose, in particular, Iraq in 1988 initiated an advanced publication procedure with the International Telecommunications Union to coordinate and reserve an orbital satellite position in the geostationary satellite orbit. In addition, Iraq had plans to go into the very small aperture terminal (VSAT) system to quickly provide specialized telecommunication services such as data and facsimile.

C. Condition after 1990 till now

8. The destruction suffered by satellite communication facilities in the 1991 war was very severe. Iraq has nevertheless managed to rehabilitate some of the hardware and restore in part some communication capacities through the use of spare parts that were available and what parts it was possible to manufacture locally.

9. However, as the years passed and with the embargo still imposed on Iraq, lack of spare parts has affected both the quantity and the quality of the telecommunication channels available with the outside world. The effect on quality has meant that facsimile and data services were very difficult to use and sometimes not available.

10. The effect on the quantity has meant long delays in trying to establish international telephone connections. This situation has severely affected many essential activities in Iraq. In addition, the continuation of the embargo has resulted in the limitation of Iraq's ability to continue to maintain adequate international communications in the near future.

III. Earth matters

11. In spite of enormous difficulties, activities have still been carried out in recent years, especially in the field of remote sensing. The following projects are some examples:

(a) The use of remote sensing data for crop estimations for the years 1988-1990 for wheat and barley;

(b) Land cover classifications for land resource inventories in the Mesopotamian Plain;

(c) Land use maps for Iraq;

(d) Determination of bodies of water and surface water inventory and reservoir mapping;

(e) The locations of springs, seeps and shallow water-tables;

(f) Soil degradation and desertification by sand dunes;

(g) Mapping the areas affected by the flooding of the Tigris and Euphrates rivers;

(h) Geological maps for Iraq on the scale of 1:100,000;

(i) Mapping of old irrigation canal systems and archaeological sites in Mesopotamia.

12. Continuation of these and other activities is essential for the welfare of Iraq's people and especially for food security, for which international assistance and cooperation such as training and the supply of recent space images of Iraq are needed.

IV. Research and related subjects

13. Information acquisition for universities and research establishments is discussed in this section.

14. Knowledge transfer, information-sharing, joint research activities, remote education and so on are denied to Iraq either because of the embargo or because of degraded communication links with the outside world, which are heavily dependent on satellite communications and space links.

15. Research and teaching is still conducted using the technology of the 1970s and 1980s. Exchange programmes between scientists are unavailable and joint research, especially on space matters, is non-existent.

16. Invitations for Iraqi scientists to attend conferences on space and related matters are scarce and, if made, no financial assistance is ever given, although Iraq has frozen hard-currency funds in nearly all countries and has no available funds of its own locally.

17. Conditions for attending training courses, if and when offered, are formulated in such a way that no Iraqi engineer, technician or student is ever likely to be offered a chance to attend.

V. Recommendations

18. The following recommendations are presented below:

(a) Iraq strongly supports the establishment of a regional centre for space science and technology education for the region of western Asia. Iraq is willing to participate actively in achieving this objective together with the countries of the region and the Office for Outer Space Affairs of the United Nations Secretariat;

(b) Major space Powers are requested to share space knowledge and to exchange data and other related space benefits with developing countries in a non-discriminatory manner, thus bridging the gap between developed and developing countries;

(c) Iraq recommends the establishment of a cooperative information network to strengthen relationships between scientists, educationalists, professionals and decision makers in the region of western Asia;

(d) Iraq would hope to benefit from the recommendations formulated by the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, held in 1982, and mentioned in the report of the Scientific and Technical Subcommittee on its thirty-fourth session (A/AC.105/672), especially with regard to the following:

(i) Technology transfer to developing countries without undue restrictions;

(ii) Supporting space technology projects in developing countries financially, technically and otherwise, to allow those countries to gain direct experience in the application of space technology;

(iii) Financially backed scholarships for Iraqis to attend training programmes and to study at all levels of education, to carry out postdoctoral research and to participate in exchanges of scientists and other related activities.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Australia

1. Australia's national paper will highlight Australia's unique advantage as a space industry location and, therefore, Australia's potential as a key player in space industry developments. Australia acknowledges that, in recent years, its profile on the international stage has declined with respect to space issues, but Australia's presence at the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) is a demonstration of its renewed commitment to that pivotal area of global interconnection and sustainable growth.

2. Australia endorses the cooperative approach that now underpins, and must underpin, all future outer space activities. The competition that bedevilled space activities in the period of the first 20 years of space exploration has given way to working together—as epitomized by the Mir project and the work towards the development of the International Space Station. The intergovernmental agreement that Australia is developing with the Russian Federation is a further tangible example of international space cooperation.

3. The theme for the Conference, "Space Benefits for Humanity in the Twenty-first Century", says it all. Space technology has much to offer for the protection of the environment in which we, and more critically our descendants, live. Scientific knowledge of the Earth and its environment and the development of remote sensing capabilities in the field of weather forecasting, disaster management and the management of the Earth's resources are becoming critically important to improving the human condition. In the area of Asia and the Pacific, where Australia is located, weather patterns are volatile and natural disasters recurrent.

4. One of the important recommendations of the regional preparatory conference on UNISPACE III for Asia and the Pacific, which took place in Kuala Lumpur in May 1998, was that there was a need to increase the awareness of policy and decision makers about the huge potential of space remote sensing and related technologies for the effective management of resources and the environment, including disaster prediction, and mitigation of such events as forest fires, floods, droughts and earthquakes. Satellites increasingly provide important information for early warning and management of the effect of those disasters as well as information that is useful in the management of agriculture, forestry, minerals, water resources and fisheries.

5. By facilitating and utilizing communications, and improving and using position location capabilities, space technology has made the global village and information age a reality for humankind. Research, education and training in space science and technology and their linkage to information technology will be keys to the future for our youth. The regional preparatory conference in Kuala Lumpur concluded that for the Asia-Pacific region in general, and its island nations in particular, satellite communications were of paramount importance. Rural telecommunications, rural education, distance learning, tele-medicine and mastering of

appropriate technologies for those services are concrete examples of maximizing the exploitation of satellite capabilities for human benefit.

6. Significantly, the spin-offs and commercial benefits from space activities are becoming more widely recognized and this is a theme Australia would like to see developed and pursued at UNISPACE III. Space is no longer a government-only issue. Although global competition has been replaced by cooperation as the driver of progress in space, this is not to say that, at the commercial level, competition does not exist. It does—more than ever—and it is a positive sign for the future of the peaceful uses of outer space.

7. It is heartening in that regard that UNISPACE III is the first United Nations global conference in which industry and all elements of civil society are participating as full partners. The global space industry has become one of the largest industries in the world with, in 1996, an estimated $77 billion in revenues and more than 800,000 people employed worldwide, in infrastructure, telecommunications, applications and support services. The bulk of this is made up of services, which together with the ground and user segments may represent more than 10 times the value of spacecraft and launches. It is expected that over the next five years, the commercial market will overtake Governments as the largest customer of the space industry.

8. This trend is driven by the totally private financing of radically new telecommunications systems such as mobile systems based on low-Earth orbit and middle-Earth orbit satellite constellations. The demand for satellite services has in turn driven the launch service market. The commercial market between 1987 and 1996 amounted to 36 satellites launched on average each year. With a projected 1,697 satellites to be launched during the period 1998-2007, the commercial launch vehicle industry is forecast to expand at more than 10 per cent annually. Science, technology and the market place are now inextricably linked in the innovation process.

9. Australia is being seen increasingly as having competitive advantages for the world aerospace industry. This is because Australia has:

(a) An ideal location in the Asia-Pacific region, including proximity to the Equator for geostationary launches;

(b) Extensive low-population land areas;

(c) A benign climate;

(d) A well developed and sophisticated infrastructure;

(e) A very stable economy and political environment;

(f) A well educated, adaptable and technically proficient workforce;

(g) Respected non-proliferation credentials that facilitate access to critical technologies;

(h) Legislative support for launches in accordance with international treaties.

10. This last point is of crucial importance and Australia's national paper will set out what Australia has recently done in that area. The Space Activities Act of 1998 provides a framework for the conduct of commercial space activities, licensing of such activities and, at the same time, ensuring that Australia meets its international obligations. The Act establishes and apportions liability for any damage caused by Australian launch activities, establishes a system for licensing Australian space launch operations, provides for recovery operations and accident investigation procedures and determines the payment of launch licensing fees that are consistent with Australia's domestic requirements.

11. Although Australia's unlimited liability and obligations under international law remain, the legislation allows the Commonwealth Government of Australia to transfer most of the

financial risks associated with space launch activities to commercial participants. Prospective international investors had advised that, while Australia had the appropriate political and geographical climate for space launches, the lack of a clear regulatory system had acted as a disincentive to further activity. The Space Activities Act of 1998, and the regulations that are currently being drafted, have now addressed those concerns.

12. The Space Licensing and Safety Office, which was established under that legislation, is now the main point of contact for launch operators on such issues as licensing of space activities, determining the level of third-party insurance and issuing launch permits. Over the next few years there are some very exciting developments planned for launch facilities in Australia and Australia's national paper will emphasize why satellite users should consider Australia—first—as a launch site.

13. Australia sees this United Nations global conference—UNISPACE III—as a seminal one in the redirection of space activities from that of competition to that of cooperation and from government command and control to commercialization. Australia also sees the Conference, through the adoption of the Vienna Declaration on Space and Human Development at its conclusion, as bringing to the general public a new perspective on the challenges and benefits of space. Australia's national paper will signal Australia's intention, determination and capabilities of being a player in the global space arena.

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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Chile

1. Chile's involvement in space activities began back in 1959, when it established a satellite tracking station administered by the University of Chile to assist the space operations of the National Aeronautics and Space Administration (NASA) of the United States of America. Since then the use of satellite systems and of satellite-derived data has spread extensively to all areas of national activities.

2. Other milestones have been the signing of an agreement between the General Directorate of Aeronautics and NASA in 1986 for the construction of an alternative landing facility for space shuttles, the conducting in February 1996 on board a NASA space shuttle of the first spaceborne Latin American medical experiment designed by Chilean research scientists, the placing in orbit of the first micro-satellite in July 1988 and the current vice-chairmanship of the Committee on the Peaceful Uses of Outer Space and of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III).

3. The purpose of remote sensing in Chile has been to develop applications based on satellite technology in the areas of oceanography, forestry, industry, mining, land use management, environmental monitoring and disaster prevention.

4. In addition, owing to its special geographical and geodesic conditions, Chile has a high incidence of seismic movements of high magnitude and is particularly vulnerable to climatic phenomena such as floods, mudslides and the unpredictable effects of the El Niño phenomenon. Those factors highlight the importance for the country of the development and application of satellite technology in order to mitigate the effects of such phenomena.

5. Since 1996, Chile has also been developing programmes aimed at utilizing the special gravitational conditions that exist in Earth orbit for the crystallization of proteins that perform specific metabolic functions, with a view to their use as targets providing a basis for the development of new medical drugs. This technology is being used by the pharmaceutical industry to produce more specific, selective and potent pharmaceutical drugs.

6. A further application of major importance is the search and rescue of ships and aircraft in distress and also of human beings, through the International Satellite System for Search and Rescue (COSPAS/SARSAT) mission control centre, which is responsible for this service throughout the Southern Cone region.

7. Chile was one of the pioneers in Latin America in the implementation of communication systems based on satellite technology. Mobile telephony will soon lead to the large-scale use of personal communications service (PCS) technology, private sector participation in this market being extensive and varied. A number of universities are also involved in research in the area of telecommunications, both through their commercial links with television channels

and other companies and through investigation of the use of the spectrum itself. In Chile, the Telecommunications Office of the Ministry of Transport and Telecommunications is the supervisory and regulatory body responsible for use of the radiofrequency spectrum. There is also a wide network of radio amateurs whose collaboration is of particular value to the community when national disasters occur and who have also become involved in satellite technology for the purposes of their activities, so much so that they have even developed a project to launch a special communications satellite for radio amateurs, CESAR-1, which it is hoped to place in orbit in the course of 2001.

8. Thanks to the particularly good conditions in Chile for astronomic observation, a number of major international observatories, such as El Tololo, La Silla and, more recently, Paranal have been constructed. The Ministry of Foreign Affairs has consequently signed an agreement with the European Organization for Astronomical Research in the Southern Hemisphere (ESO) for the promotion of scientific research and human resource development in the field of astronomy. In that connection, Chile has ratified all the United Nations space treaties and strongly supports the concept of outer space as the common heritage of humanity to be used for exclusively peaceful purposes.

9. For all these reasons, Chile hopes that by achieving the objectives established for UNISPACE III and by pursuing the activities and addressing the topics proposed in the provisional agenda, this international meeting will yield positive results and make a genuine contribution to the development and integration of States.

10. It is obvious that in order to take practical advantage of the benefits of space technology applications, it is essential that States give precedence to the common interest, as expressed in the principle of "the exploration and peaceful uses of outer space". Countries today, especially developing countries, need to be capable of assimilating technological progress through an understanding of the present and its projection into the future, by formulating appropriate strategies to close the technology gap with the more advanced nations and thus avoid being overtaken by events.

11. Chile also wishes to underline that the Conference is of fundamental importance for the country and for all participants since it provides an opportunity to conclude bilateral and multilateral cooperation agreements and to agree upon financing formulas for implementing projects based on the use of space technology. This is the time to establish points of convergence and common interest and to learn how to use, for the benefit of humankind, the vast possibilities opened up by space. If we respond to this challenge and to the expectations of our peoples, we will be equal to the task of translating technological advances into welfare, progress and development. In this way, access to space will make it possible to foster peace and stability in the particular setting of each country and within the global context to which mankind belongs.

Milestones in Chilean space activity

1959	Establishment of the first cooperation agreement in space matters between the Government of Chile and NASA, giving rise to the Space Research Centre (CEE) at the University of Chile and the installation of the first satellite tracking station in the country.
1965	Designation of the National Telecommunications Enterprise (ENTEL) as a signatory company of the International Telecommunications Satellite Organization.
1968	Construction of the Longovilo Satellite Communications Earth Station, the first of its kind in Latin America.

1993	Hosting by Chile of the Second Space Conference of the Americas, for which Chile also provided the temporary secretariat during the subsequent three years.
1993	Organization by the Federation of Radio Amateur Clubs of Chile of a corporation, AMSAT-CE, for the development of radio amateur satellites.
1995	Commissioning of the mission control centre MCC-Santiago as part of the COSPAS/SARSAT system.
1996	Launching into orbit of the first protein crystallization experiment, "ChagaSpace", designed by Latin American scientists and originally developed in Chile.
1997	Publication of the DAN-08 05 Aeronautical Standard, which established the technical requirements for use of the Global Positioning System (GPS) as a primary navigation tool.
1997	Implementation in Chile of the World Area Forecast System.
1997	Convening of the First Latin American Seminar on Aerospace Medicine.
1997	Raimundo González Aninat, Director of Special Policy at the Ministry of Foreign Affairs, selected to serve as Vice-Chairman of the Committee on the Peaceful Uses of Outer Space, a function he performed until 1999, when he became Chairman of the Committee for a three-year term.
1998	Launch into orbit of the first Chilean satellite, FASat-Bravo.
1998	Hosting by Chile of the Regional Preparatory Conference for UNISPACE III for the Latin American and Caribbean Group, which concluded with the issue of the Concepción Declaration.
1998	Raimundo González Aninat took over the vice-chairmanship of UNISPACE III.

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Abstract of the national paper of Romania

1. The paper presents an overview of the main activities and developments in Romania in the field of space science, technology and its applications. The presentation is divided into the following sections: history, organizational matters and institutional framework, National Space Programme and regional and international cooperation.

I. History

2. The following developments testify to the fact that Romania is recognized as a country with an aerospace tradition and represents the basis for the space enterprise in the future:

(a) The existence of historical personalities such as Conrad Haas (constructor of multi-stage rockets with delta stabilizers, Sibiu, 1529), Aurel Vlaicu (the first Romanian aerospace engineer), Traian Vuia (designer and constructor of the first autonomous take-off aeroplane in 1906), Henri Coanda (designer and constructor of the first jet aeroplane in 1910), Hermann Oberth (designer of space rockets and "father of space navigation"), Elie Carafoli (important contributions in aerodynamics and space sciences, President of the International Astronautical Federation (IAF) in 1961-1962);

(b) The development of the aeronautical industry, which at present includes the manufacturing, based on original designs or under licence, of more than 20 types of transport aeroplanes, helicopters, passenger medium couriers and light aeroplanes;

(c) Romanian contributions to more than 30 scientific and technological space missions, including the mission of the first Romanian cosmonaut in 1981;

(d) Experience in the field of space applications: since 1997 the International Telecommunications Satellite Organization (INTELSAT) Cheia ground station with two 32-metre antennas is operational; applications of remote sensing imagery and Global Positioning System technology for use in the oil industry, agriculture, environment, cartography and land use;

(e) The large sector of commercial space applications, as space communications, applications of satellite remote sensing, geographic informational systems, positioning and navigation, and global information systems.

3. In order to reconsider the importance of space activities as necessary elements for the development of the Romanian community, the public authorities in cooperation with the private sector have created and supported this endeavour.

II. Organizational matters and institutional framework

4. The national coordinating body of the space activities is the Romanian Space Agency (ROSA), established in 1991 and reorganized by government decision in 1995 as an independent public institution under the auspices of the Ministry of Research and Technology (at present the National Agency for Science, Technology and Innovation).

5. The objectives of ROSA are to promote and coordinate space development and national efforts in the field and, as a government representative, to promote international cooperation. In particular, ROSA is authorized to establish research and development centres relating to specific objectives of the Romanian Space Programme.

6. One of the Agency's main responsibilities is to coordinate the activities of the national space research and development programme. In cooperation with the Scientific Council for Aeronautics and Space of the Government's Advisory Board for Research and Development, the public financing body, ROSA assigns the funding to the following areas: basic space science, space structures, technology, microgravity, communications, information, education, Earth observation and remote sensing applications, life sciences and medicine.

7. On behalf of the Government, ROSA is the national representative in the cooperative agreements with international organizations, such as European Space Agency (ESA) and Committee on Space Research (COSPAR), as well as bilateral governmental agreements. Together with the Ministry of Foreign Affairs, ROSA represents Romania in the sessions of the Committee on the Peaceful Uses of Outer Space and its subcommittees.

8. Romania is a party to all major international treaties concerning space activities.

III. National Space Programme

9. The National Space Programme encompasses the main space activities of the country. Research projects are included in the National Research and Development Programme Horizon 2000, which contains a separate section for space research and development. About 40 research and higher education institutions are affiliated to the ROSA network, developing specific project components of the national space plan.

10. The financing priorities are (a) medium-term projects and initial studies with effective spin-offs to the national economy, defined by ROSA together with users and those who benefit from the results; (b) basic and advanced space research in specific areas undertaken on an international cooperative basis or as lead agency in the research group in the particular field; and (c) space infrastructure objectives.

11. Successful launches of scientific experiments and devices designed by Romanian scientists have been carried out in the context of several international space missions: a number of scientific instruments and devices developed by Romanian scientists are at present in orbit. Meaningful scientific results have been obtained in astrophysics, Earth environment studies, microgravity research, fundamental space science, thermal elasticity and information processing. Those results have been presented at international congresses, including the COSPAR Scientific Assembly and the IAF Congress. A significant number of research reports have been published in international journals and a large number of projects have led to spin-

offs, especially in satellite communications, small aircraft onboard technology, thermography algorithms and information technology.

12. Since 1998, the National Space Programme has been redrafted in the following main areas: space strategy and infrastructure, space science, space applications, space technology and spin-offs. In order to develop space infrastructure and capacity-building, projects are oriented towards space science and its applications. Special emphasis has been placed on projects of national significance, including a small satellite for hazard monitoring and a public database of satellite imagery, which will become operational in the next few years.

13. One of the most significant objectives of the National Space Programme is the development, under the auspices of the United Nations, of a national centre for research and education in space science and technology.

14. As regards the role of private industry, important progress can be noted in the development of space communications, applications of satellite remote sensing, geographic information systems, positioning and navigation systems and devices, global information systems and telemedicine. Several companies in Romania are at present promoting applications in geology, meteorology, cartography, natural resources, navigation systems and satellite networking for information.

IV. Regional and international cooperation

15. Regional and international cooperation has always played an important role in the planning and implementation of space benefits for economic and social development, which is a prerequisite for the sustainable progress of mankind.

16. During the 1970s and 1980s, Romania was an active member of the programme of the Council on International Cooperation in the Study and Utilization of Outer Space (INTERCOSMOS). At the same time, Romania has been affiliated to several relevant international organizations, such as COSPAR, the International Telecommunications Satellite Organization and the International Mobile Satellite Organization, and consequently has developed joint activities. Romania is also a member of the International Council for Science and IAF and takes part in their major scientific activities.

17. Another aspect of the international cooperation of Romania has been its cooperation with ESA. Romania was one of the first Eastern European countries to conclude a cooperation agreement with ESA in the field of the peaceful use of outer space, signed in 1992 and ratified by the Romanian Parliament in July 1993. As part of that cooperation, research projects with other European countries (including training of Romanian scientists in ESA countries, access to European space information systems, technical support given by ESA for the development of indigenous space applications and workshops), as well as other relevant activities have been carried out.

18. Romania has participated effectively in the work of the Committee on the Peaceful Uses of Outer Space, acting as Vice-President from its establishment in 1959 to 1997. Romanian delegations are actively represented in the Committee and in its two subcommittees (Scientific and Technical, and Legal).

19. Together with Greece, Romania has introduced during the sessions of the Committee the concept of a network of space science and technology research and education institutions for central, eastern and south-eastern Europe. At present the representatives of Bulgaria, Greece, Poland, Romania, Slovakia and Turkey have agreed to establish the network, which will be organized under the coordination of the Office for Outer Space Affairs. In that context,

Romania has offered infrastructure facilities for the establishment of a regional centre for space science and technology, as an element of the network.

20. ROSA has established and promoted mutual relations with other space agencies and organizations, with major interest in both global and regional integration. Cooperation projects with the Italian Space Agency were included in the intergovernmental agreement between Romania and Italy. ROSA has also signed cooperation agreements with counterpart agencies from Bulgaria and Hungary. More than 120 cooperation agreements have been concluded between research and development entities from Romania and institutions from more than 40 countries. In preparation for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), Romania organized, together with the Office for Outer Space Affairs, and hosted the Regional Preparatory Conference for Eastern Europe. The recommendations and proposals agreed upon at the Preparatory Conference constitute the regional input for consideration at UNISPACE III.

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Abstract of the national paper of Pakistan

I. Introduction

1. The main objective of Pakistan's space programme being executed by the national space agency, the Space and Upper Atmosphere Research Commission (SUPARCO), is to promote peaceful exploration and applications of space science and technology in the country. While pursuing that objective, it is quite natural that the space programme would also contribute to building national scientific and technological potential. The principal applications are aimed at bringing about the socio-economic development of society. The focus of the programme is on areas related to satellite communications; satellite remote sensing for natural resources and environmental survey; development of facilities for designing, assembly/fabrication and launching of communication satellites in geostationary orbit and light-weight satellites in near-Earth orbit for various scientific and applications purposes; and study of natural and physical phenomena in the upper atmosphere and space through rocket launchings and other means. Over the past two decades, SUPARCO's space programme has continued to expand in terms of the range of its research, applications and related activities.

II. Satellite technology

2. Pakistan has developed sufficient technological capability to plan, design, build and test satellites for scientific and technological experiments. The aim is to reduce dependence on satellites owned by other countries through development, launching and operation of Pakistan's own satellites. In 1990, SUPARCO designed, fabricated and launched its first satellite, BADR-I, into a low circular orbit, on board a Chinese vehicle, in "piggy-back" mode. Extremely valuable data were gathered on the performance of BADR-I in orbit. The findings from BADR-I provided the basis for the design of the second satellite BADR-B, which has been completed and dispatched to the Russian Federation for a planned launching in 1999 into a low-Earth, 1,000-kilometre, Sun-synchronous orbit on board a Russian launch vehicle. The design life of BADR-B is over two years. The satellite will carry experiments for the monitoring of clouds, land usage, radiation levels, for storage and forward communication, engineering and evaluation of hardware/software in the space environment.

3. Initiated by SUPARCO for domestic communications and television broadcasting from space, the PAKSAT project was cleared by the Federal Cabinet on 16 April 1997 for award to Alcatel Espace of France and a licence in that regard has been issued.

4. Pakistan's involvement in a small multi-mission satellite project within the framework of Asia-Pacific multilateral cooperation in space technology and applications will further facilitate indigenous development of higher-resolution imaging payloads.

5. Development and launching of Earth observation satellites will provide high-resolution data-acquisition capability for better assessment, monitoring and exploitation of natural resources. To support the satellite development programme, Pakistan has established a general-purpose S-band tracking, telemetry and control station at Lahore. The station will be used in the operation of BADR-B and subsequent Pakistan satellites.

III. Development of satellite launch vehicles

6. Starting with the development of small sounding rockets for studies of the upper atmosphere, Pakistan has embarked on the project to design, develop and manufacture rocket motors, leading to the development of satellite launch vehicles capable of putting small satellites into low-Earth orbits of altitudes between 400 and 600 kilometres.

IV. Applications of space science and technology

7. Present-day applications of satellite data are widespread and cover research and operational and commercial activities. Those activities are of interest both in the global contexts and in the regional, national and local context, where Earth observation data are successfully applied in support of a host of different applications in remote sensing and meteorology.

8. Pakistan operates two satellite Earth stations, one at Deh Mandro (since 1974) and the other at Islamabad (since 1987). The two Earth stations provide a 24-hour direct link, through the International Telecommunications Satellite Organization (INTELSAT) system, between Pakistan and other countries of the world. In addition to the terrestrial microwave network linking the various national television stations and centres, Pakistan has leased a transponder on the ASIASAT for telecasting educational and entertainment programmes to viewers in Pakistan and other countries in the region.

9. Pakistan has been pursuing a multidisciplinary satellite remote sensing (SRS) applications programme for resource surveying and mapping and environmental monitoring since 1975. Several research studies using data from various remote sensing satellite systems have been carried out. Increasing use is now being made of geographic information system (GIS) technology in conjunction with SRS data. These studies have covered such diverse disciplines as agriculture, forestry, geography, geology, geomorphology/environmental studies, hydrology, oceanography and flood mapping.

10. Commissioned in 1989, Pakistan's satellite ground station at Islamabad acquires and processes data from three different remote sensing Earth observation satellite systems. The station was upgraded and modernized in 1998 with state-of-the-art hardware and software to acquire and process data from the new generation of remote sensing satellites. This has led to significantly improved throughput capacity, generation of data products in new media and archiving of data in more compact media.

11. Under the atmospheric research programme, automatic picture transmission (APT) images and Television Infrared Observation Satellite (TIROS) Operational Vertical Sounder (TOVS) data from the satellite of the National Oceanic and Atmospheric Administration of the

United States of America as well as supporting data are used for various atmospheric, meteorological and environmental studies.

V. Assessment of the programme

12. Pakistan possesses a reasonably well developed infrastructure for pursuing a comprehensive space research and application programme. It is expected that the space programme will diversify further, enter still more sophisticated fields and move closer to operational use of space technology in applications such as resource mapping, environmental management, disaster preparedness and mitigation; search and rescue of vessels and people in distress; more accurate navigation and position determination; networking of databases; and development of materials in microgravity conditions.

VI. Future programme

13. The main goal of the space programme is to provide operational space services to the nation. The focus is on satellite communications and remote sensing of natural resources. Those services are sought to be achieved through the indigenous development of operational spacecraft and satellite launch vehicles. It is planned eventually and on a local basis to design, develop, test and qualify operational satellites with high reliability and long life. The national space programme is poised to make substantial progress, in the next few years, for the socio-economic development of the country.

14. Pakistan has thus made steady and notable progress towards the development of technological capability in the high-tech fields of space science and technology. That policy will be continued until the attainment of self-reliance in those fields. The future of the space programme in Pakistan is thus full of promise.

VII. Vital international issues

15. Several international issues have been the concern of various nations. Major impediments to obtaining and expanding space application programmes in Pakistan are:

(a) Lack of awareness at the decision-making level;

(b) Lack of awareness of the benefits of appropriate space technology applications on the part of users;

(c) Non-availability of trained technical manpower;

(d) High initial costs of space technology hardware;

(e) High development and maintenance costs of space systems;

(f) Limited involvement of the private sector and industry in space technology applications, with space activities funded mainly by the Government and the public sector;

(g) Non-standardized data, hardware, software and analytical tools, in particular with regard to remote sensing systems;

(h) Reluctance to transfer technology and know-how to developing countries.

16. Pakistan's view is that one of the ways to promote the peaceful uses of outer space is for more countries to be afforded opportunities to interact with the "space-faring" nations by

participation in collaborative programmes in the applications of space science and space technology to utilize the benefits derived from those applications. To attain that objective, creation of an indigenous capacity in the countries, especially in the developing countries, should be considered on a priority basis.

17. Pakistan maintains that, in accordance with the Principles Relating to Remote Sensing of the Earth from Outer Space, adopted by the General Assembly, the availability of remote sensing data should not be withheld from particular countries based upon their political status, since all space-related activities should be conducted for the benefit and in the interest of all countries.

18. Pakistan is of the view that space-faring States that are responsible for launch activities should adopt and enforce tougher guidelines regarding space debris mitigation in order to prevent the cost of space activities from increasing beyond the means of developing countries.

19. Pakistan maintains that the definition and delimitation of outer space is necessary to guard against unhindered national airspace violations of any State's skies. Pakistan also believes in equitable access by all States to the geostationary orbit, taking into account the special interests and existing limitations of the developing countries.

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Abstract of the national paper of Uzbekistan

Development of space technology in Uzbekistan

1. Space technology is recognized all over the world as one of the major factors in the dynamic development of national economies. At the time of independence, Uzbekistan possessed some science, technology and industry potential in space engineering and materials, transformable large-scale space structures, analytical information systems and telecommunications. In that connection, in 1992 the Uzbekistan State Space Agency, Uzbekcosmos, was founded by order of the President of Uzbekistan.

2. Given the potential of Uzbekistan in the space field and taking into account the national priorities of the Republic, one of the main problems is the creation of infrastructure for the development of space technology applications. The problem includes development and implementation of satellite technologies for television and broadcasting, nation-wide data network, tele-health, tele-education and navigation; and wide and effective application of satellite remote sensing data for purposes of agriculture and water management, geodesy and cartography, hydrometeorology, rational management of natural resources and the environment.

3. The creation of Uzbekistan's satellite communication system is being undertaken in two stages. Firstly, a number of ground stations are being set up, leasing existing communication satellites of foreign countries. The second stage consists of the launching of a national communications satellite. Implementation of remote sensing and geographic information system (GIS) technologies is carried out within the framework of two state programmes entitled "Complex of receiving, processing and distributing satellite information" and "National automated control and alarm system for emergency situations".

4. In Uzbekistan, much attention has been paid to training national personnel, including staff for space activities. Specialists in space science and technology are educated and trained at the Tashkent State Aviation Institute, Tashkent State University and Tashkent State Technical University. The participation of Uzbekistan in the foundation in November 1995 of the Regional Centre for Space Science and Technology Education in Asia and the Pacific has made it possible to train a number of young experts from Uzbekistan each year in remote sensing and GIS, satellite communications, satellite meteorology and space sciences.

5. The stability of the domestic situation and the openness of state policy ensure successfu development of international relations in the field of space science and technology. Uzbekista participates annually in the Congress of the International Astronautical Federation and i symposiums and workshops on the implementation of space technology applications i developing countries and holds the annual Conference on Space Research. Technologies an Conversion supported by the European Space Agency. The goal of developing internationa relations is to attract foreign investment into the Republic, to implement modern spac technology applications and to train national personnel according to international standards

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Abstract of the national paper of Slovakia

I. The Slovak space mission to the Mir Space Station

1. From 20 to 28 February 1999, a short-term space flight of the first Slovak astronaut, Ivan Bella, took place during a Russian/French/Slovak mission. The programme of the Slovak space mission was named after M. R. Stefanik, the outstanding Slovak scientist in astronomy, politician and French general (1880-1919). The first Slovak astronaut carried out a research programme in space physics and the life sciences prepared by institutes of the Slovak Academy of Sciences. Since space flight takes place under unique conditions of environmental stresses to the neuroendocrine system (absence of gravity, one of the fundamental forces that shapes life on Earth), the study of the responses to those stresses can provide new insight into neuroendocrine regulation and behaviour. The overall goals of life science observation was therefore to use the unique environment of space flight to study the response of the human organism to specific stresses, to increase understanding of the mechanisms responsible for the neuroendocrine, developmental and behavioural changes that occur in space flight, to obtain new data to enhance human space flight and to apply the results of space research for the health, well-being and economic benefit of people on Earth.

2. On the station Mir, four experimental projects were carried out, dosimetry (in space physics) and endotest, senso-asymetria and quail (in the life sciences). The dosimetry project was devoted to the study of cosmic rays and energy particles in the orbit of Mir. In the first part, passive track detectors (passive detectors of cosmic ray nuclei) were exposed during the mission and evaluation of linear energy transfer and cosmic ray composition was studied.

3. The aim of the endotest project was an investigation of the responses of the neuro-endocrine and physiological functions of astronauts to various types of stress load during space flight, evaluation of the degree of "stressogenic" influence of space flight on working capacity and measurement of the functional reserves of the endocrine system when faced with rapid and unpredictable stressogenic situations during space flight, especially of long duration. For this project, the special new Plasma-03 appliance was used for the collection of human blood, for its centrifugation and the freezing of blood samples and for their transport to Earth for analysis. Those analyses are now being performed at the Institute of Experimental Endocrinology of the Slovak Academy of Sciences.

4. The aim of the senso-asymetria project, designed by the Institute of Normal and Pathological Physiology, Slovak Academy of Sciences, was an investigation of the effects of asymmetric activity of sensory impulses (vestibular or proprioceptive) and an involvement of

that activity in the development of kinetosis and orientation illusions during space flight and the readaptation period after space flight. A preliminary analysis of the results of observations performed before, during and after space flight on the Slovak astronaut showed a successful process of adaptation of the vestibular system to microgravity.

5. The aim of the quail project was to assess the effects of the defined intensity of gravity on the early post-embryonic development of Japanese quail aboard the orbital station Mir. The bird is seen as an element of the closed ecological and alimentary system and it is very important as a source of food for human beings during space flight of long duration. A question arising from a series of previous experiments was how to provide conditions for the survival and normal development of quail during the first days of post-embryonic development. It was decided to solve this problem by using artificial gravity produced by a special centrifuge on board Mir. The bio-material obtained was recently analysed using microbiological, biochemical and morphological methods at the Institute of Animal Biochemistry and Genetics of the Slovak Academy of Sciences. The final summarized results can be expected at the end of 1999 and will be published in scientific journals.

6. During the space mission, two ground projects, concerning training and metabolism, were also performed. The aim of the training project was investigation of the effects of endurance training of astronauts during the pre-flight period on their neuroendocrine and cardiovascular responses to various stress stimuli. The aim of the metabolism project was to study the metabolic consequences of decrease in the physical activity of astronauts during space flight and in subjects during simulated microgravity on Earth.

7. The results obtained in the two projects should help determine optimal pre-flight training for astronauts and some consequences of limited physical activity during space flight from the point of view of neuroendocrine regulation of body function.

II. Space physics, geophysics and astronomy

8. Activities in these areas are devoted to the study of physical phenomena at the surface of the Sun, in interplanetary space and in the magnetosphere, atmosphere and ionosphere of Earth, as well as to cometary explorations. The traditional tools of such research are cosmic rays, energy particles in space, space plasma and interplanetary matter.

9. Energy particles have been studied systematically using the databases from the Interball-1 and 2, and Magion-4 and 5 instruments developed at the Institute of Experimental Physics of the Slovak Academy of Sciences in Košice in international collaboration. This analysis provided new results relevant to the understanding of dynamic processes in the magnetosphere, in the magnetosheath and upstream from the bow shock. Statistical studies of particle populations are continuing, using data from the Interball and Prognoz-10 projects. Low-altitude active (IK24) measurements have shown the short-duration (tenths of a second) pulsations of energy electrons precipitating into the atmosphere. Detailed maps of gamma ray distribution at 500 km altitude have been obtained from Coronas-I measurements.

10. Energy particle monitoring devices have been developed for the two projects planned for low-altitude missions.

11. Cosmic ray studies are based on the Lomnicky Stit massif in the High Tatry mountains, where neutron monitor measurements are continuing. The possibility of using cosmic ray variability as one of the parameters for prediction of geomagnetic variability is currently being analysed.

12. Solar wind parameters from satellite measurements have been analysed in relation to ring current energization during storms.

13. Data on coronal mass ejections show a close relationship with the occurrence of type II radio bursts and long-duration solar events.

14. Changes in climate from 1871 to 1995 have been studied in terms of variable solar forcing, based on data from the Hurbanovo meteorological station.

15. Studies of the lower ionosphere and middle atmosphere have focused on chemical composition, dynamics and appropriate solar effects using experimental data.

16. Non-linear features of solar activity represented by the Wolf sunspot number and sunspot area have been analysed using the concept of self-organized criticality. The existence of 60-year cycles of solar activity has been confirmed.

17. Only a few selected areas of research are mentioned here. A list of papers where the results are summarized and more specific details are given can be found in the biennial national reports of Slovakia to the Committee on Space Research.

III. Life sciences

18. At the Institute of Animal Biochemistry and Genetics of the Slovak Academy of Sciences in Ivanka pri Dunaji, a model experiment involving insemination of Japanese quail during hypodynamy has shown that the efficiency of insemination depends on its frequency. In comparison with natural mating, the efficiency was 62.8 per cent lower after two successive inseminations and 41.7 per cent after three successive inseminations performed over the 22 days of the hypodynamy experiment. The volume of ejaculate, sperm concentration and testosterone levels in males decreased after 15 days of hypodynamy.

19. A joint experiment with American scientists was carried out aboard the Mir orbital station in 1996 using an innovative module of the Incubator-2 device. In that experiment, on days 14 and 16 of incubation 9 embryos were identified out of 20 fixated eggs.

IV. Meteorology

20. The Slovak Hydrometeorological Institute uses data from geostationary meteorological satellites (GMS) mainly in operational practice. Images from the Meteosat-6 and 7 satellites (taken at intervals of 30 minutes) are received and processed on a regular basis. Images from other geostationary satellites (GOES-8 and 9, GMS and Meteosat-5) are received and processed on an occasional basis. Imagery that shows cloud fields over Europe and adjacent areas of the Atlantic in three spectral bands is used for weather analyses and forecasting in the form of animation sequences or of individual images. Individual images are often combined with other meteorological information such as zones of temperature, humidity, pressure and precipitation and can also be used as input to numerical weather prediction models. Expert findings are included in studies of cloud evolution over time, in particular that of cumulus clouds connected with showers and thunderstorms in the central European region. The aim is to distinguish between developing and dissipating phases of clouds. Mean time trajectories in dual-channel diagrams are obtained and used to study the life cycle of clouds and to estimate phases of cloud development.

21. Remote sensing activities have been carried out over the last two years mainly in the following institutes in Slovakia: the Institute of Geography of the Slovak Academy of Sciences in Bratislava; the Forest Research Institute in Zvolen; the Slovak Environmental Agency in Banská Bystrica; and the Faculty of Electrical Engineering and Informatics, Technical University of Košice.

22. The main results were obtained within the framework of a number of international projects: Coordination of Information on the Environment (CORINE) Land Cover, the Phare MARS and Environmental-Related Applications (MERA) '92 (with subprojects relating to land degradation mapping and forest ecosystem mapping), the Danube Remote Sensing Demo Project and the research project on computational intelligence tools in image processing carried out jointly by the Technical University of Košice and the University of Minnesota, United States of America. The following results are worth mentioning: the CORINE land cover map of Slovakia on the scale of 1:500 000; maps of potential and actual risks of soil erosion in Slovakia on the scale of 1:250 000; map of the distribution of tree species in Slovakia; and application of a model to determine the eutrofication risk in water in the river Hron catchment area using remote sensing and Geographic Information System technologies.